

Revision of the World Genera of the Subtribe Stigmina (Hymenoptera: Apoidea: Sphecidae: Pemphredoninae), Part 1

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Abstract.—The following new genera are described: *Araucastigmus*, *Aykhustigmus*, *Incastigmus*, *Llaqhastigmus*, and *Tzustigmus*. The following new species are described: *Araucastigmus masneri*, *yanillus*; *Aykhustigmus fritzi*, *patanawi*, *phasti*, *warawa*; *Incastigmus inti*; *Llaqhastigmus ambiguus*, *australis*, *chutiyana*, *colombianus*, *ecuatorialis*, *jatunkirus*, *llutanis*, *mantanti*, *muthus*, *nigricollaris*, *santan-deranus*, *sapanis*, *shachus*, *sharkeyi*; *Parastigmus huacuvus*, *nina*; *Tzustigmus khmer*, *syam*, *veda*, and *wuming*. New synonymy: *Stigmus smithii* Ashmead is placed under *Incastigmus thoracicus* (Ashmead). A key to world genera is presented, and history, biology, generic relationships, and biogeography are discussed. Species of *Araucastigmus*, *Aykhustigmus*, *Llaqhastigmus* and *Parastigmus* are keyed and described, and their distributions are presented.

INTRODUCTION

This contribution is intended as the first in a series of papers dealing with the world species of the Stigmina. Members of the Stigmina are small, generally 3 to 5mm in length, and black or red and black in coloration. The group contains an estimated 150 species distributed in all areas except the polar regions but for the most part is found throughout the southern hemisphere tropics. This first paper describes five new genera, *Tzustigmus*, *Araucastigmus*, *Aykhustigmus*, *Incastigmus* and *Llaqhastigmus*, treats the species of the smaller genera, reviews biology, taxonomic history, and presents an analysis of generic phylogeny before considering the biogeography of the Stigmina. Future papers will deal with the species of *Incastigmus*, *Stigmus*, and *Carinostigmus*.

Morphological Terms And Symbols.—Terminology generally follows Bohart and Menke (1976) but in some cases terms need clarification and some new terms are introduced. They are listed below:

Appressed setae: setae forming an angle close to 0° with the body surface.

Carinate: a series of relatively large ridges (see microcarinate below) that do not impart a dull appearance to the body.

Lateral sphere of propodeum: area of propodeum curving between propodeal enclosure and side.

LOD: maximum diameter of lateral ocellus.

Mesosoma: the thorax plus the propodeum.

Metasoma: the apparent abdomen consisting of the abdomen excluding the first segment or propodeum.

Micropore field (Fig. 32): a grouping of very small pores usually visible only by scanning electron microscope, but by stereomicroscope apparent as a discrete microsculpture patch.

Microcarinate: a series of parallel ridges so fine as to impart a dull appearance to the body.

Microsculpture: minute sculpture imparting a dull appearance to the body.

OOD: least distance between lateral ocellus and eye.

Preomaular area: = preomaular area of Bohart and Menke (1976).

Sternum: metasomal sternum.

Tergum: metasomal tergum.

Transscutellar sulcus: the anterior transverse sulcus of the scutellum, immediately posterior to the transscutal articulation.

Transverse sulcus: on pronotal dorsum, the transverse sulcus immediately posterior to the transverse carina.

*: holotype examined.

Species Treatments.—Descriptions of all included species are provided. Descriptions of new species are based on all the material examined. In species demonstrating variability descriptions are based on representatives of the most prevalent phenotype with variation noted throughout the description. Collection data for the primary type material are presented exactly as they appear on the label, thus several spellings for the same locality and collector, and several formats for date of collection will be encountered. Collection data for secondary type specimens are presented in a standardized format organized by country and state or province. In previously described species the Material Examined section lists only localities of collection.

Sources Of Material.—Over 10,000 specimens from 47 institutions were amassed for this study. The following institutions have provided material used in this paper or loaned types. The abbreviation preceding the institution is that used in the text to designate type repositories.

- AEI** American Entomological Institute, 3005 sw 56th Ave. Gainesville, FLORIDA 32608 USA. V.K. Gupta, the late H.K. Townes, D. Wahl.
- ANIC** Australian National Insect Collection, CSIRO, Division of Entomology, GPO Box 1700 Canberra, ACT 2601, AUSTRALIA. I.D. Naumann.
- BISH** Bishop Museum, 1525 Bernice Street, P.O. Box 19000-A Honolulu, HAWAII 96819 USA. G.M. Nishida.

- BMNH** The Natural History Museum, Cromwell Road, London, SW7 5BD ENGLAND. C.R. Vardy.
- BRD** Biosystematics Research Division, CLBRR, Agriculture Canada, Research Branch, K.W. Neatby Building, Ottawa, Ontario, CANADA K1A 0C6. L. Masner.
- CARN** Carnegie Museum, 4400 Forbes Avenue, Pittsburgh, PENNSYLVANIA 15213 USA. J.E. Rawlings.
- CAS** California Academy of Sciences, Golden Gate Park, San Francisco, CALIFORNIA 94118 USA. W.J. Pulawski.
- FSCA** Florida State Collection of Arthropods, Division of Plant Industry, Department of Agriculture, Gainesville, FLORIDA 32601 USA. L.A. Stange.
- IIES** Consejo Nacional de Investigaciones Cientificas y Tecnicas, Instituto de Investigaciones Entomologicas Salta (INESALT), 9 de Julio 14-Casilla de Correo 3, 4405 Rosario de Lerma, Salta, ARGENTINA. M.A. Fritz.
- LILLO** Fundacion Miguel Lillo, Instituto de Zoologia Miguel Lillo 251, 4000 San Miguel de Tucuman, ARGENTINA. A. Willink.
- MACN** Museo Argentino de Ciencias Naturales, Seccion Entomologia, Angel Gallardo 470, Casilla de Correo 220, Sucursal 5, 1405 Buenos Aires, ARGENTINA. A. Roig Alsina.
- MCSN** Museo Civico Di Storia Naturale "Giacomo Doria" I-16121 Genova, via Brigata Liguria, N. 9, ITALY. V. Raineri.
- MCZ** Museum of Comparative Zoology, The Agassiz Museum, Harvard University, Cambridge, MASSACHUSETTS 02138 USA. C. Vogt.
- MPEG** Museu Paraense Emilio Goeldi, Av. Magalhaes Barata, 376—C.P.

HISTORY

- 399, CEP 66000-Belem, Para, BRASIL. W.L. Overal.
- NMW** Naturhistorisches Museum Wien, 2. Zoologische Abteilung (Insekten), A-1014 Wien, Burgring 7, ÖSTERREICH (Austria). M. Fischer.
- OSU** Oregon State University, Department of Entomology, Corvallis, OREGON 97331 USA. G.R. Ferguson.
- PMA** Provincial Museum of Alberta, 12845-102 Avenue, Edmonton, Alberta, CANADA T5N 0M6.
- RNH** Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden, NETHERLANDS. K. van Achterberg.
- SEM** Snow Entomological Museum, University of Kansas, Lawrence, KANSAS 66045 USA. R.W. Brooks.
- TMA** Természettudományi Múzeum Allattara, H-1088 Budapest, Baross u. 13 HUNGARY. J. Papp.
- UCV** Instituto de Zoología Agrícola, Universidad Central de Venezuela, Maracay 2101-A, VENEZUELA. J. Luis García.
- USNM** Systematic Entomology Laboratory, USDA % U.S. National Museum, NHB 168, Washington, D.C. 20560 U.S.A. A.S. Menke.
- ZIN** Insect Systematics Laboratory, Zoological Institute, Russian Academy of Sciences, Sankt-Peterburg 199034 RUSSIAN FEDERATION.
- ZMD** Zoologisk Museum, Department of Entomology, Universitetsparken 15, DK 2100 Kobenhavn, DANMARK (Denmark). O. Lomholdt.
- ZMMU** Zoological Museum of the Moscow State University, Herzen Street 6, Moscow 103009 RUSSIAN FEDERATION. A.V. Antropov.

G.W.F. Panzer (1804) described the genus *Stigmus* for a single species, *Stigmus pendulus* from Europe. Species description in the Stigmina accumulated more or less *ad hoc* until Kohl (1890) produced the first world synthesis of *Stigmus* and related genera. His revision of the *Pemphredon* genus group provided a sound generic grouping that is still, a century later, the basis of modern classification. Over the period of 1890–1911, 24 species were described by such notable authorities as Kohl (1892, 1905), Cameron (1891), Fox (1892, 1897), Ashmead (1900), Mantero (1901), Rohwer (1911) and Strand (1911). During this period Turner (1907) described the genus *Paracrabro* from Australia.

By 1920 most of the descriptive work had shifted to fauna of the southern hemisphere culminating with Tsuneki's (1954) description of a new subgenus, *Carinostigmus*, accompanying a revision of the Asian and European *Stigmus*. In subsequent papers Tsuneki (1963, 1966, 1971) went on to describe numerous species and subspecies in the Oriental Region while Leclercq (1959) described species from the Afrotropical Region. The Nearctic fauna was revised by Krombein (1973) at which time he described a new subgenus *Atopostigmus*. Work on all groups of sphecoid wasps reached a high point when Bohart and Menke (1976) published a world generic revision, a landmark synthesis unprecedented in the history of the group. That work delineated the subtribe Stigmina to which the following 7 genera were assigned: *Arpactophilus*, *Paracrabro*, *Stigmus*, *Carinostigmus*, *Spilomena*, *Microstigmus*, and *Xysma*. Subsequently Krombein (1984) described 4 new species of *Carinostigmus* and a new subgenus *Perissostigmus* from Sri Lanka. Budrys (1987) described new species from the former Soviet far east. Antropov (1992) described

the genus *Parastigmus* from the Neotropical Region.

Among the most important publications influencing the classification of the Stigmina was Menke's (1989) paper on new species of *Arpactophilus* from New Guinea. The author indicated that the subtribal limits proposed by Bohart and Menke in the 1976 world revision should be reconsidered. He established a new subtribe, *Spilomenina*, containing *Arpactophilus*, *Spilomena*, *Microstigmus* and *Xysma*. Furthermore Menke was able to unite these genera using a newly discovered apotypic character state, that of reduced papal segmentation. Menke's work first of all reduced the Stigmina to 3 genera: *Paracrabro* (1 Australian species), *Stigmus* (30 species, Holarctic, Neotropical and Oriental), and *Carinostigmus* (25 species, Afrotropical and Oriental). Secondly, no synapotypic character states supporting the 3 genera remaining in the Stigmina were known, which meant that the Stigmina could be a plesiotypic assemblage representing an artificial rather than a natural grouping. This paper provides ample evidence of the monophyly of the Stigmina and indicates that 9 genera and about 150 species are included.

BIOLOGY

Published records (Arnold 1924; Eickworth 1967; Iwata 1964; Janvier 1962; Krombein 1956, 1958a, 1958b, 1961, 1963, 1984; Rau 1928; Richardson 1915; Smith 1923; Tsuneki 1970; Wasbauer and Simonds 1964; Yasumatsu and Watanabe 1964) indicate that *Stigmus* and *Carinostigmus* nest in twigs or pre-existing cavities and prey on aphids (Homoptera: Aphidoidea). Twig nests are usually constructed by excavating pithy twigs like *Rubrus*, *Sambucus*, or *Sassafras* among others. Pre-existing cavities include straws of thatch, holes or borings in timber and galls. Nests vary in length from 8cm to half a metre, the cells are constructed in linear series separated by masticated wood or plugs of

pith. Cells are mass provisioned or possibly progressively provisioned with 12–30 aphids depending on prey size and species of wasp. Progressive provisioning creates a subsocial situation where mothers and daughters are present in the same nest. Iwata (1964) observed progressive provisioning in nests of *Carinostigmus iwatai* (Tsuneki) and found larvae and adults of different ages in nests of *C. monstrosus* (Tsuneki). The only reported cleptoparasites are chrysidid wasps of the genus *Omalus*.

Unpublished or anecdotal records indicate some species of Stigmina are sand nesting, a presumed plesiotypic character state. Krombein (1973, 1984) in his revisions of Nearctic *Stigmus* and Sri Lankan *Carinostigmus*, lent some credibility to these observations when he noted nesting differences in females with 2 or 3 mandibular teeth. Females with 3 mandibular teeth excavated nests in pithy twigs or stems while those with 2 teeth used pre-existing cavities in the ground. The implication is that those species constructing nests evolve more complex mandibular dentition presumably to perform more specialized tasks. *Microstigmus* (*Spilomenina*) have a bidentate mandible that is not used in construction of a complex nest suspended beneath a leaf and housing multiple generations. The foregoing indicates that mandibular dentition likely bears a straightforward relationship to nest construction when mandibles are employed for that purpose.

More reliable evidence of sand nesting can be inferred from the presence of a fore tarsal rake and a broad pygidial plate in the female or a remnant of that plate in the male. The fore tarsal rake is a series of elongate setae which are used to move sand. Members of Stigmina lack a fore tarsal rake but have spatulate setae on the rake area, possibly a secondary adaptation to manipulation of nest material. The pygidial plate is a flat specialized area defined by a carina or groove on the 6th

metasomal tergum in the female and the 7th in the male. In sand nesting species this plate occupies a much greater proportion of the tergum than in twig or cavity nesting species. Almost all Stigmina have a narrow pygidial plate occupying a small fraction of the tergum indicating twig or cavity nesting behaviour. A few species have an intermediate pygidial plate and several Argentine species have a large pygidial plate with a remnant of this plate in the male. Manfredo Fritz (personal communication) has observed sand nesting *Stigmus* in Argentina, he was unable to capture any specimens. Specimens from his collection, used in this study, contained females with relatively large pygidial plates and with remnants in several males, possibly representing the only true sand nesting Stigmina.

In summary, biological observations, although detailed in several instances, are available for few species only. More observations are necessary to document nest construction and the existence of social behavior in the group. The Stigmina appear to be twig or cavity nesting and restrict prey to aphids. There is some anecdotal evidence of sand nesting behaviour in southern Neotropical species. A number of new genera have no behavioral data whatever. Observations on these genera are often impeded by the small size of the individuals but would offer a fertile field of study to a dedicated biologist.

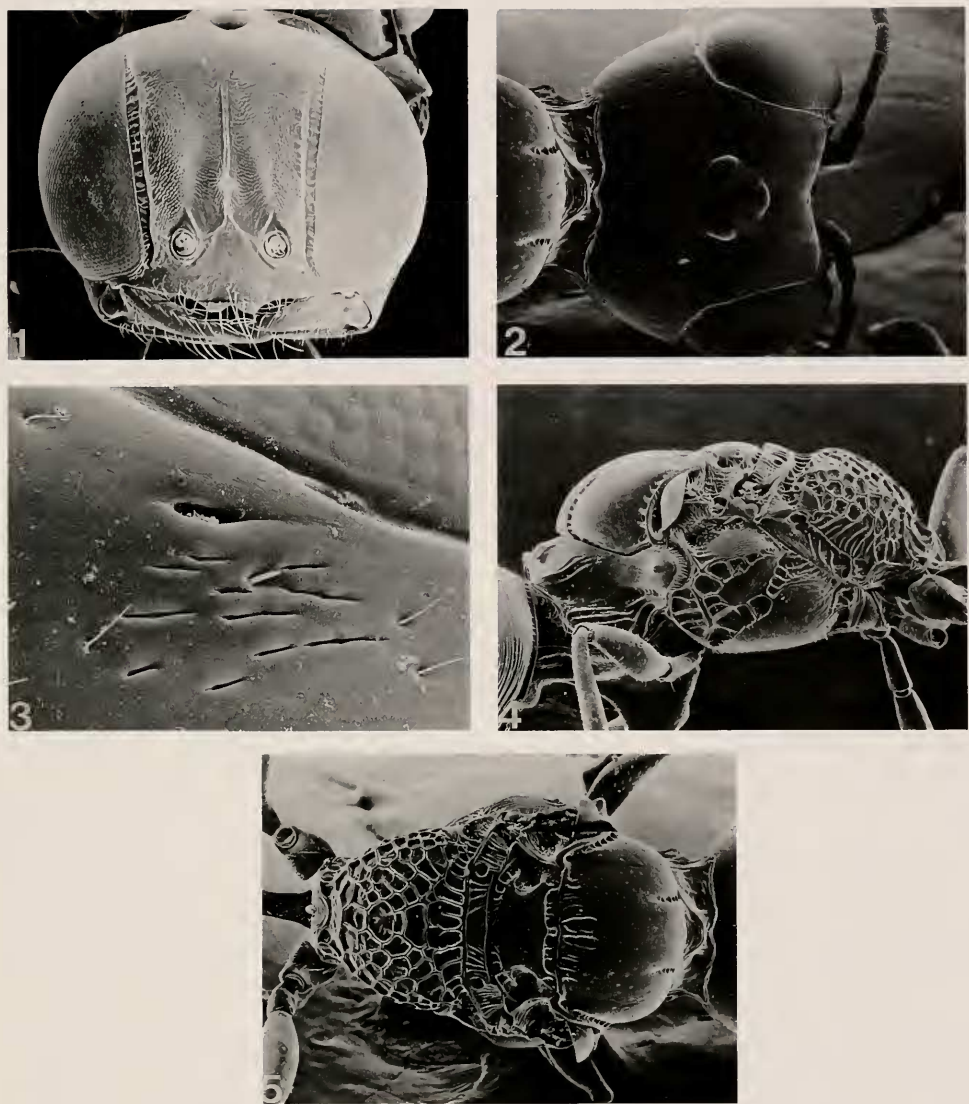
SUBTRIBE STIGMINA

Diagnosis.—The Stigmina, as here defined, includes 9 genera with a microsetal or micropore fields laterally on metasomal sternum II (Figs. 44, 45), more or less centrally on the fore wing stigma (Figs. 46, 47) and on the vertex between the lateral ocellus and the compound eye (Figs. 3, 8, 20, 26, 32). The latter character is not fully developed in several genera but consists of several pits in a small depression. The stigmal pit field is diffuse in 11 species from Chile and Argentina and

may not be readily apparent in these instances. These characters are found in all members of the Stigmina and nowhere else in the Pemphredoninae. They are thus autapotypies that unambiguously delineate the Stigmina. Described genera include *Carinostigmus* Tsuneki, *Paracrabro* Turner, *Parastigmus* Antropov, and *Stigmus* Panzer. In addition to *Paracrabro* and *Parastigmus*, five new genera are proposed and 33 of the 58 species are treated in the present paper: *Tzustigmus* (5 species, Oriental, far eastern Palearctic), *Parastigmus* (4 species, southern Neotropical), *Araucastigmus* (3 species, Chile), *Paracrabro* (1 species, Australian), *Aykhustigmus* (4 species, Neotropical), *Incastigmus* (25 species, Neotropical), and *Llaqhastigmus* (14 species, Neotropical).

Description.—Head. Palpal formula 6–4; mandibular socket closed; antennal sockets placed low on frons near or touching clypeus (Fig. 1); frons unmodified by grooves, except occasionally along inner eye margin; vertex with a micropore field or at least a few associated pits between lateral ocellus and eye (Figs. 3, 8, 20, 26, 32); genal setae usually normal, not elongate setae scattered among short setae (exceptions among some males of *Stigmus* and *Carinostigmus*).

Mesosoma. Pronotum with transverse carina present, at least laterally (Fig. 2); omaulus present; episternal sulcus undeveloped; hypersternaulus present, obliquely oriented across mesopleuron (Fig. 4); fore tarsus of female without rake; mid coxa with oblique dorsal carina; inner hind coxal carina absent; hind coxa without elongate bristle; metasternum with shallow posterior emargination; propodeal enclosure present (Fig. 10); stigma of fore wing enlarged, lenticular with discrete micropore field (Figs. 46, 47); marginal cell normal size, subequal to or larger than stigma, closed and bordering anterior wing margin; 2 submarginal cells; submarginal cell II quadrate; submarginal cell I out of line with respect to marginal



Figs. 1-5. *Carinostigmus* sp. ♀. 1, Head, frontal view. 2, head and prothorax, dorsal view. 3, micropore field between lateral ocellus and compound eye. 4, mesosoma, lateral view. 5, mesosoma, dorsal view.

and discoidal cells; submarginal cell I without spur, closed; recurrent vein received by submarginal cell I; 2 discoidal cells; hind wing cells closed.

Metasoma. Petiole present, longer than wide, setae short, scattered over surface; tergum I without lateral carina; male ster-

na without elongate specialized setae; sterna II and often III with lateral microsetal patches (Figs. 44, 45); sternum VI without apical pegs; pygidial plate present in female, almost always absent in male; sternum VIII of male elongate, volsella divided into digitus and cuspis.

KEY TO GENERA OF STIGMINA

- 1. Hind wing submedian cell reduced, cu-a positioned about halfway from wing base to origin of media (Fig. 50); Old World, except Australian Region *Carinostigmus* Tsuneki
- 1'. Hind wing submedian cell normal size, cu-a positioned next to origin of media (Fig. 49) 2
- 2. Hind wing media diverging beyond cu-a (Fig. 49) or mesopleuron coarsely areolate to sternopleural region (Figs. 22, 28) 3
- 2'. Hind wing media diverging before cu-a (Fig. 48); mesopleuron not entirely coarsely sculptured (Fig. 34) 5
- 3. Mesopleuron coarsely sculptured to sternopleural region (Figs. 22, 28); male with prominent genal carina separated from mid outer orbit by a distance subequal to basal width of mandible (Fig. 21); Neotropical *Aykhustigmus* Finnermore, new genus
- 3'. Mesopleuron mostly unsculptured, shiny; genal carina, if present, close to eye margin (Fig. 9) 4
- 4. Interantennal tubercle absent (Fig. 40); eyes not margined by a carina: petiole carinate; Japan *Stigmus* Panzer, in part
- 4'. Interantennal tubercle present (Fig. 7); eyes margined by a carina (Fig. 9); petiole smooth, round, at most microcarinate; Oriental, far eastern Palearctic *Tzustigmus* Finnermore, new genus
- 5. Acetabular carina absent (Fig. 11); southern Neotropical 6
- 5'. Acetabular carina present (Fig. 43); widespread 7
- 6. Pygidial plate small, narrow, present in female only; mandible in male bidentate and in female tridentate at apex; body shiny, without microsculpture (Figs. 14, 15); Chile *Araucastigmus* Finnermore, new genus
- 6'. Pygidial plate broad, present in both sexes, evanescent in male; mandible of both sexes bidentate at apex; microsculpture present on head and often most of body; Argentina, Chile *Parastigmus* Antropov
- 7. Vertex micropore field absent; Australia *Paracrabro* Turner
- 7'. Vertex micropore field present (Figs. 20, 26, 32) 8
- 8. Mandibles in male bidentate, female uni-, bi-, or usually tridentate; male clypeal apex usually with lateral bevel (Fig. 42); scutum without trace of median groove or posteromedian pit but may be ridged (Fig. 41); apicoventral mandibular tooth in female, acute (Fig. 39); widespread, except Afrotropical and Australian Regions . . *Stigmus* Panzer, in part
- 8'. Mandibles tridentate in both sexes; male clypeal apex without bevel; scutum usually with median groove or posteromedian pit (Figs. 33, 35); females lacking median scutal groove have apicoventral mandibular tooth enlarged and broadly truncate (Fig. 37); Neotropical 9
- 9. Scutum with median groove or posteromedian pit (Figs. 33, 35); apicoventral mandibular tooth in female, acute (Fig. 39); labrum quadrilobed; throughout Neotropical Region *Incastigmus* Finnermore, new genus
- 9'. Scutum without trace of median groove or posteromedian pit (Fig. 38); female with apicoventral mandibular tooth enlarged, broadly truncate (Fig. 37); labrum usually bilobed, rarely 4-lobed; Neotropical: restricted to continental South America *Llaqhastigmus* Finnermore, new genus

Tzustigmus Fিন্নমোৰ, new genus
(Figs. 6–11, 44, 45, 47)

Derivation of Name.—Tzu, a Chinese term meaning master or teacher, in this case referring to the relatively basal position of the genus within the Stigmina and its subsequent value in the inference of polarization of character states in the subtribe.

Diagnosis.—The combination of an interantennal tubercle, the hind wing media diverging just beyond cu-a, and a mostly unsculptured mesopleuron will separate this genus from all others in the Stigmina.

Description.—Head. Labrum quadri-lobed with median emargination narrow and deep; mandibular apex bidentate in male, tridentate in female; apicoventral mandibular tooth of female acute; mandible without inner basal tooth; male clypeal apex unmodified, not bevelled; 3 clypeal teeth in female; interantennal tubercle developed; frontal carina absent; vertex with micropore field undeveloped consisting of only a few associated pits in a puncture-like depression; inner orbits converging below; eyes margined by a

carina; occipital carina present, simple in female, foveolate in male; occipital carina complete, not intersecting hypostomal carina.

Mesosoma. Scutum without median groove; notaular grooves normal, not elongate. Acetabular carina absent, omaulus curving forward toward prothorax. Scrobal sulcus absent to weakly present. Hypoepimeral area without coarse sculpture. Hind tibia with 2 or 3 spines on posterior margin. Mid basitarsus of male as long or longer than next 3 tarsomeres combined. Fore wing setae absent in cellular area. Hind wing media diverging just after cu-a; submedian cell of normal size, not reduced.

Metasoma. Petiole smooth and round, occasionally finely microcarinate. Pygidial plate narrow, present in female only. Digitus elongate, toothed; cuspis not lobed but multitoothed.

Type Species.—*Tzustigmus syam* new species.

Distribution.—Oriental, far eastern Palearctic.

Species Transferred.—*Carinostigmus rhinocerus* Budrys.

KEY TO SPECIES OF TZUSTIGMUS

(Males of *T. rhinocerus* and *T. veda* are unknown)

- 1. Hypoepimeral area with a single ventral carina forming upper margin of scrobal sulcus (Fig. 9); scrobal sulcus foveolate; male fore basitarsus unmodified; female with area adjacent to propodeal enclosure unsculpted at least posterolaterally; south India to Vietnam 3. *syam* Fিন্নমোৰ, new species
- 1'. Hypoepimeral area carinate on ventral half; scrobal sulcus not evident; male fore basitarsus angulate medially; female with area adjacent to propodeal enclosure finely carinate ... 2
- 2. At least dorsal surface of petiole microcarinate; Thailand to Vietnam 1. *khmer* Fিন্নমোৰ, new species
- 2'. Dorsal surface of petiole unsculptured, shiny, dorsolateral sulci may be present 3
- 3. Pronotal transverse sulcus unsculptured; south India 4. *veda* Fিন্নমোৰ, new species
- 3'. Pronotum carinate on transverse sulcus 4
- 4. Sternopleural region closely and finely striatopunctate; Russian Federation: far east 2. *rhinocerus* (Budrys)
- 4'. Sternopleural region shiny, punctate only; Taiwan 5. *wuming* Fিন্নমোৰ, new species

1. *Tzustigmus khmer* Finnamore,
new species

Derivation of Name.—The species epithet, *khmer*, refers to the 11th century invaders of the Dvaravati Kingdom then occupying present day Thailand which is within the distribution range of this species.

Diagnosis.—This species is readily distinguished from its relatives by the microcarinate petiole (at least dorsally).

Description.—Male. Length 4.5 mm.

Head. Flagellomeres without visible tyli. Head shiny, without microsculpture. Clypeus obscured by dense appressed setae that extend along inner orbits to half height of scape. Inner and outer orbit margined by coarsely foveolate sulcus that is absent ventrally and anterodorsally. Frons lower two thirds with irregular, coarse, transverse carinae. Vertex with sparse, evanescent punctures. Ocelli closer to each other than to eye, OOD $1.4 \times$ LOD. Gena with sparse punctures and sparse setae that increase in density ventrally. Occipital carina foveolate, more coarsely so ventrally.

Mesosoma. Pronotum with transverse sulcus longitudinally carinate; side longitudinally carinate. Scutum shiny, sparsely punctate, with anterior transverse microcarinae becoming longitudinal adjacent to admedian lines, posterior edge margined by a transverse row of short carinae. Hypoepimeral area microcarinate on ventral half. Scrobal sulcus not or at most only slightly evident. Sternopleural region shiny, without microsculpture, sparsely punctate. Omaulus and hypersternaulus coarsely foveolate. Scutellum entirely or mostly shiny, without microsculpture anteriorly, but sometimes present posteriorly. Metapleuron carinate. Propodeum with side entirely finely longitudinally carinate, dorsolateral carina evanescent, lateral spheres shiny with microcarinae, enclosure with irregularly areolate sculpture. Fore basitarsus angulate at basal third.

Metasoma. Petiole round, longitudinally microcarinate dorsally and laterally, ventrolateral carinae faintly indicated posteriorly. Terga II–V usually with large sparse punctures in a more or less transverse median band. Sterna IV–VI with apical band of dense punctures up to one puncture diameter apart, apical margins impunctate. Metasoma with microsculpture so fine as to impart an oily sheen that is most evident on the terga.

Color. Ground color black. White: pronotal lobe. Brown to yellow-brown: mandible, palpi, antenna, legs, except coxae, tegula, stigma.

Female. Length 5 mm. Similar to male except as follows: clypeus sparsely setose, underlying sculpture visible, punctures sparse and up to several diameters apart on median area which is slightly bulging. OOD $2.3 \times$ LOD. Body sculpture stronger than in male, punctation closer than in male particularly on sternopleural region where fine punctures are evenly distributed up to 2 diameters apart. Mesopleuron longitudinally carinate from dorsal hypoepimeral area to hypersternaulus. Fore basitarsus straight, not angled at basal third. Petiole round, entirely microcarinate. Abdominal tergum VI with narrow, shiny, impunctate pygidial plate.

Material Examined (2♂, 2♀).—Holotype: ♂, VIET NAM: 15 km nw. of Dalat [Da Lat], 1850 m, 5-V-1960. L.W. Quate (BISH). Paratypes: **THAILAND:** Chiangmai: Doi pui, 2-IV-1958. T.C. Maa (♂: 1 BISH). **VIETNAM:** Fyan, 1200 m. 11-VII-9-VIII-1961. N.R. Spencer (♀: 1 BISH). **VIETNAM:** Mt. Lang Bian, 1500–2000 m. 19-V-8-VI-1961. N.R. Spencer (♀: 1 BISH).

Distribution (Map 1).—Thailand to Vietnam.

2. *Tzustigmus rhinocerus* (Budrys),
new combination

Carinostigmus rhinocerus Budrys 1987:54, ♀, ♂. Holotype: ♀ (not examined), Russian Federation: Khabarovsk, Khlekhtsir Range, Levaya River (ZIN).

Diagnosis.—The combination of a hypopimeral area carinate on ventral half, sternopleural region closely and finely striatopunctate, propodeum with carinate lateral spheres and petiole shiny without microcarinae (dorsolateral carinae are faintly indicated) separate this species from others in the genus.

Description.—Male. Not seen.

Female. Length 6.5 mm.

Head. Clypeus with relatively long decurved setae, not obscuring underlying sculpture, punctures coarse and contiguous on median area which is strongly bulging. Inner and outer orbit margined by a coarsely foveolate sulcus which is absent ventrally and anterodorsally. Frons irregularly, transversely carinate adjacent to lower inner orbit becoming striatopunctate toward vertex. Scapal basin dull, densely microsculptured. Vertex shiny anteriorly, obscurely striatopunctate, punctures sparse with most over 3 diameters apart; posterior vertex with transverse microsculpture. Lateral ocelli closer to each other than to eyes, OOD $2.6 \times$ LOD. Gena striatopunctate, more densely so ventrally. Occipital carina simple, not foveolate.

Mesosoma. Pronotum with transverse sulcus longitudinally carinate; side longitudinally carinate. Scutum shiny, sparsely punctate, with anterior transverse microcarinae that become longitudinal adjacent to admedian lines, posterior edge margined by transverse row of short carinae. Mesopleuron longitudinally carinate from dorsal part of hypopimeral area to hypersternaulus (which is coarsely foveolate). Sternopleural region shiny with dense, fine punctures (that are less than 1 diameter apart), somewhat finely striatopunctate toward posterior. Omaulus foveolate. Scutellum shiny anteriorly, sparsely punctured, microsculptured on posterior third. Metapleuron longitudinally carinate. Propodeal side longitudinally carinate throughout; dorsolateral carina present, irregular; lateral spheres carinate to propodeal enclosure which is irregularly areo-

late. Fore basitarsus straight, subcylindrical, not bent or otherwise modified.

Metasoma. Petiole round, shiny with dorsolateral carina partially developed anteriorly. Terga II–V with medium size, widely scattered sparse punctures; microsculpture on anterior terga imparts an oily sheen to metasoma. Sterna IV and V with apical bands of punctures, punctures at least 2 diameters apart; sternum VI with close nearly contiguous punctures.

Color. Ground color black. White: pronotal lobe. Brown to yellow-brown: mandibles except apex, palpi, scape, underside of flagellum, legs except coxae and hind femur, tegula, pygidial plate.

Material Examined (1♀ paratype).—**RUSSIAN FEDERATION: Khabarovsk:** Khekhtsir, 18th km.

Distribution (Map 2).—Russian Federation far east.

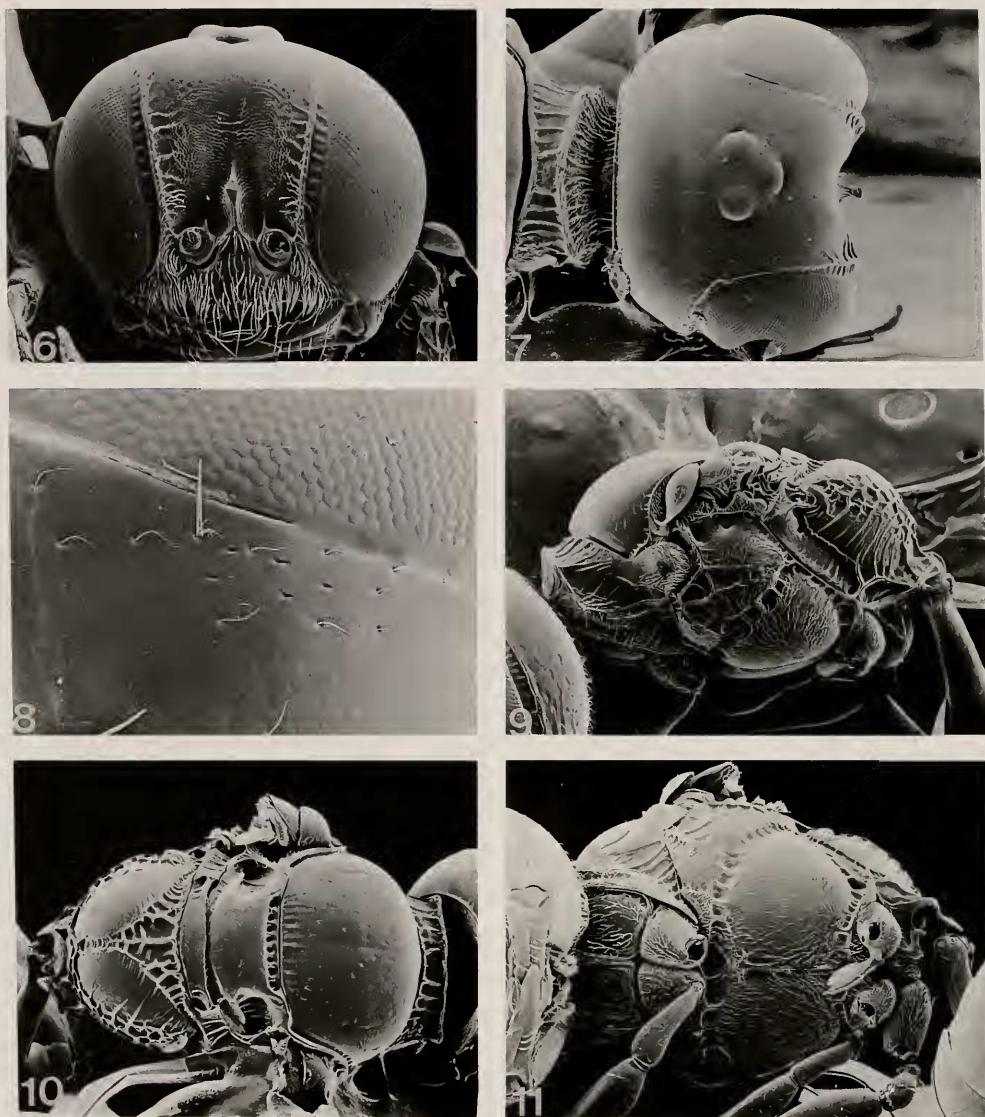
3. *Tzustigmus syam* Finnamore, new species

Derivation of Name.—The species epithet, *syam*, is a sanskrit term for dark used by 12th century Khmers to refer to the dark skin of the people migrating south from southern China at that time. It is used here to refer to the generally dark appearance of this species.

Diagnosis.—The unsculpted (non-carinate) hypopimeral area will distinguish this species from others in the genus.

Description.—Male. Length 4 mm.

Head. Flagellomeres without tyli. Head shiny with microsculpture on frons, gena and posterior vertex. Clypeus obscured by dense appressed setae which extend along inner orbits to a point $\frac{1}{4}$ height of scape. Inner and outer orbit margined by a coarsely foveolate sulcus except ventrally and dorsally. Frons microsculptured, without carinae except along inner orbital margin where they are evanescent. Vertex sparsely punctate, with minute punctures, appearing impunctate. Ocelli closer to each other than to eyes; OOD $1.4 \times$ LOD.



Figs. 6-11. *Tzutigmus syam* ♀. 6, head, frontal view. 7, head and prothorax, dorsal view. 8, micropore field between lateral ocellus and compound eye. 9, mesosoma, lateral view. 10, mesosoma, dorsal view. 11, mesosoma, ventrolateral view.

Gena almost impunctate, with microsculpture present to absent. Occipital carina foveolate, areolae becoming evanescent dorsally.

Mesosoma. Pronotum with transverse sulcus longitudinally carinate; side longitudinally carinate. Scutum shiny, sparsely punctate, without anterior microcarinae; with transverse row of short longitudinal

carinae next to posterior margin. Hypoepimeral area microsculptured, not carinate; scrobal sulcus distinct, carinate and foveolate. Sternopleural region shiny, without microsculpture, sparsely micropunctate. Omaulus and hypersternaulus coarsely foveolate. Scutellum shiny, with several punctures mediolaterally. Metapleuron not carinate. Propodeal side with

evanescent carinae, less so in the discal area; dorsolateral area a series of areolae, lateral spheres shiny, weakly carinate basally becoming evanescent and absent toward midline; propodeal enclosure areolate. Fore basitarsus straight, cylindrical.

Metasoma. Petiole round, shiny, without microsculpture or dorsolateral carina. Terga impunctate (this character is variable in other species and as more specimens are encountered may prove to be punctate in some specimens). Sterna IV to VI with apical bands of small punctures less dense than in previous species. Terga with fine microsculpture so as to impart an oily sheen.

Color. Ground color black. White: pronotal lobe. Brown to yellow-brown: mandibles except apically, palpi, antenna, tegula, legs.

Female. Length 4.5 mm. Similar to male except as follows: clypeus with 3 median teeth, sparsely setose, underlying sculpture visible medially; median area bulging but not strongly so and shiny with punctures 1.5 to 3 diameters apart. OOD $2.6 \times$ LOD. Occipital carina not as strongly areolate. Gena striatopunctate ventrally. Propodeal side more strongly carinate than in male. Tergum VI with a narrow shiny pygidial plate.

Material Examined (2♂, 8♀).—**Holotype:** ♀, THAILAND: Chiangmai Prov., 10 km w. Fang, V-5-69, G.R. Ballmer, on tree trunk (PMA). **Paratypes:** **INDIA: Karnataka:** Bangalore, 916 m, 9-XII-1973, Ghorpade collection, Bangalore (♀: 1 ZMD). Nilgiri Hills, Naduvattam, 6000 ft. May 1958, P.S. Nathan. George R. Ferguson Collection, 1972 (♂: 1 OSU). **THAILAND: Chiangmai:** 10 km w. Fang, 5-V-69, G.R. Ballmer, on tree trunk (♀: 2 PMA). Doi Suthep-Pui natn. Park, Konthathan waterfall area, 600 m, 20-27-X-1979. Zool. Mus. Copenhagen Exped. (♀: 1 ZMD). **VIETNAM:** Dalat [Da Lat] 6 km s., 1400–1500 m, 9-VI-7-VII-1961, N.R. Spencer, ♀: 1 BISH. Fyan, 900–1000 m. 11-VII-9-VIII-'61, N.R. Spencer (♀: 1 BISH). Fyan, 1200 m.

11-VII-9-VIII-'61, N.R. Spencer (♀: 1 BISH, ♂: 1 BISH). The male was collected at a light trap.

Distribution (Map 3).—India to Vietnam.

4. *Tzustigmus veda* Finnamore, new species

Derivation of Name.—The species epithet was arbitrarily selected for the species. Veda, in Hindu perspective is the eternal wisdom realized by the ancient seers or sages preserved over thousands of years by generations of professional reciters in oral transmission.

Diagnosis.—The non-carinate, smooth, transverse pronotal sulcus is diagnostic for this species.

Description.—Male unknown.

Female. Length 4.5 mm.

Head. Head shiny, faint microsculpture on frons and posterior vertex. Clypeus with 3 median teeth, sparsely setose, underlying sculpture visible medially, shiny, closely punctate, punctures 1–2 diameters apart. Inner and outer orbit margined by a coarsely foveolate sulcus except ventrally and dorsally. Frons with fine transverse microcarinae and some coarse transverse carinae near inner orbital sulcus. Vertex shiny with fine microsculpture posteriorly, punctures fine, sparse. Lateral ocelli closer to each other than to eyes, OOD $1.9 \times$ LOD. Gena shiny, sparsely punctate dorsally, closely punctate to striatopunctate ventrally. Occipital carina simple, obscurely foveolate ventrally.

Mesosoma. Pronotum with transverse sulcus unsculptured although longitudinal carinae are present at extreme dorsolateral end, side longitudinally carinate. Scutum shiny, sparsely punctate, with fine anterior transverse microcarinae that turn longitudinally adjacent to admedian lines; with transverse row of short carinae next to posterior margin. Hypoepimeral area carinate over most of its area. Scrobal sulcus evanescent. Omaulus and hypersternaulus foveolate. Sternopleural region shiny, without microsculpture, punctures

fine 1–2 diameters apart. Scutellum shiny anteriorly, posterior $\frac{2}{3}$ microsculptured and sparsely punctate. Metapleuron carinate. Propodeum carinate laterally, dorsolateral carina present, lateral spheres finely carinate to propodeal enclosure which is areolate.

Metasoma. Petiole round, shiny, without microsculpture, dorsolateral carina faintly indicated anteriorly. Terga with few fine evanescent punctures and with microsculpture imparting oily sheen. Sterna III–V with sparse bands of punctures, VI closely punctate, punctures less than 1 diameter apart near apex.

Color. Ground color black. White: pronotal lobe. Brown to yellow-brown: mandibles except apex, palpi, scape, tegula, legs.

Material Examined (1♀).—Holotype: ♀, S. INDIA: Cinchona, Anamalai Hills [Anaimalai], 3500 ft. May 1959, P.S. Nathan. George R. Ferguson Collection (OSU).

Distribution (Map 4).—Southern India.

5. *Tzustigmus wuming* Finnamore, new species

Derivation of Name.—The species epithet, *wuming*, is a Chinese term derived from Taoist philosophy referring to that which is unnameable.

Diagnosis.—Resembling *T. rhinocerus* in having the hypoepimeral area carinate on ventral half, the propodeum with closely carinate lateral spheres, and the petiole shiny without microcarinae. Unlike *rhinocerus*, *wuming* has a smooth, shiny, sparsely punctate sternopleural region. Additionally the pleuron of *wuming* is unsculptured immediately above hypersternaulus, while in *rhinocerus* it is sculptured from the mid hypoepimeral area to hypersternaulus and sternopleural region.

Description.—Male. Length 4 mm.

Head. Flagellomeres without tyli. Head shiny with microsculpture on frons, vertex and occasionally gena. Clypeus obscured by dense, appressed setae which extend along inner orbits to about half height of

scape. Inner and outer orbits margined by a coarsely foveolate sulcus except ventrally and dorsally. Frons microsculptured on scapal basin, elsewhere with relatively coarse, irregularly transverse carinae which meet dorsally. Vertex sparsely punctate with minute punctures. Ocelli closer to each other than to eyes; OOD $1.8 \times$ LOD. Gena sparsely punctate dorsally, more densely punctate ventrally; microsculpture present to absent. Occipital carina foveolate.

Mesosoma. Pronotum with transverse sulcus longitudinally carinate; side longitudinally carinate. Scutum shiny, sparsely punctate; with transverse anterior microcarinae that turn longitudinally adjacent to admedian lines; posterior edge margined by a transverse row of short carinae. Hypoepimeral area carinate. Scrobal sulcus indistinct, carinae not extending ventrally to hypersternaulus. Sternopleural region shiny, without microsculpture, sparsely and obscurely punctate. Omaulus and hypersternaulus coarsely foveolate. Scutellum shiny, without microsculpture except faintly microsculptured on posterior third; sparsely punctate. Metapleuron carinate on ventral half. Propodeal side carinate, dorsolateral area with slightly more coarse irregular sculpture, lateral spheres carinate; propodeal enclosure areolate. Fore basitarsus angulate at basal third.

Metasoma. Petiole round, shiny, without microsculpture or dorsolateral carina except remnant anteriorly. Terga sparsely, obscurely punctate. Sterna III–VI with broad bands of punctures most of which are less than 1 diameter apart. Terga with fine microsculpture imparting oily sheen.

Color. Ground color black. White: pronotal lobe. Brown to yellow-brown: palpi, antenna, legs except coxae, tegula, stigma.

Female. Length 5–6 mm. Similar to male except as follows: clypeus sparsely setose, underlying sculpture visible on median area, punctures sparse (1–2 diameters apart) on median area which is slightly

bulging, with 3 weakly developed apical teeth. Frons with irregular transverse carinae not as strong as in male and sometimes evanescent dorsally on midline. OOD 2.2–2.3 × LOD. Sternopleural region slightly more densely punctate than in male, punctures pin prick fine. Fore basitarsus straight, not angulate. Abdominal tergum VI with narrow shiny pygidial plate. Mandibles yellow-brown.

Material Examined 2♂, 4♀).—Holotype: ♀, TAIWAN: Wushe, 1150 m, III-16-'83, H. & M. Townes (AEI). Paratypes: **TAIWAN**: Wushe, 1150 m, III-23-'83, H. & M. Townes. 1150 m (♂: 1 AEI). Wushe, IV-2–83, Henry Townes (♀: 1 AEI). Wushe, 1150 m, IV-19–83, Henry Townes (♀: 1 AEI). Wushe, 1150 m, IV-26–83, Henry Townes (♂: 1 AEI). Wushe, 1150 m, V-3–83, Henry Townes (♀: 1 AEI).

Distribution.—(Map 5). Taiwan.

PARASTIGMUS Antropov

Parastigmus Antropov 1992:97. Type species *Parastigmus argentinus* Antropov, 1992, by original designation and monotypy.

Diagnosis.—The combination of a microsculptured body, the hind wing media diverging just before cu-a, a broad pygidial plate, and the lack of an acetabular carina will separate this genus from others in the Stigmina.

Description.—Head. Labrum quadri-lobed, with median emargination narrow and deep. Mandible with apex bidentate

in both sexes; apicoventral tooth of female acute; inner basal tooth in at least females of some species. Clypeal apex in male without bevelled modifications; 4 clypeal teeth present in female, although median teeth are often fully reduced imparting a deep, broad, median emargination. Inter-antennal tubercle absent. Frontal carina absent in male, present but simple in female. Vertex without micropore field. Inner orbits parallel in female, converging below in male. Eye not margined by a carina. Occipital carina simple, complete, not intersecting hypostomal carina.

Mesosoma. Scutum without median groove; notaular groove normal, short, not elongate. Acetabular carina absent; omaulus curving forward toward prothorax. Scrobal sulcus absent in male, evanescent in female. Hypoepimeral area without coarse sculpture. Mid basitarsus in male unmodified, as long as or longer than next 3 tarsomeres combined. Hind tibia with 2 or 3 spines on posterior margin. Fore wing without setae in cellular area. Hind wing media diverging before cu-a; submedian cell of normal size, not reduced.

Metasoma. Petiole carinate. Pygidial plate broad, present in both sexes. Digitus elongate, toothed; cuspis not lobed, toothed.

Distribution (Map 34).—Southern Neotropical.

Species Transferred.—*Stigmus patagonicus* Mantero.

KEY TO SPECIES OF *PARASTIGMUS*

- 1 Males 2
- 1' Females 5
- 2 Mesosoma entirely dull, microsculptured; Chile 2. *huecuvus* Finnamore, new species
- 2' Scutellum or sternopleural region shiny, without microsculpture; Argentina 3
- 3 Sternum II and apices of terga I and II, red 1. *argentinus* Antropov
- 3' Metasoma all black 4
- 4 Pedicel subequal to length of first flagellomere (1:1) 4. *patagonicus* (Mantero)
- 4' Pedicel longer than first flagellomere (1:0.7) 3. *nina* Finnamore, new species
- 5 Apex of clypeus transverse with 4 small equally developed teeth; labrum not exposed; Chile 2. *huecuvus* Finnamore, new species

- 5' Apex of clypeus with a broad, deep median emargination or biemargination exposing labrum; lateral teeth prominent; median lobe present or absent; Argentina 6
- 6 Pedicel longer than first flagellomere (1:0.6–0.7); mesosoma red or black 3. *nina* Finnamore, new species
- 6' Pedicel subequal to length of first flagellomere (1:0.9–1.1); mesosoma black 7
- 7 Clypeus biemarginate, median lobe developed; clypeus and inner orbits bare, without appressed setae 1. *argentinus* Antropov
- 7' Clypeus with single broad median emargination, median lobe evanescent or absent; clypeus and inner orbits with appressed setae that partially obscure surface 4. *patagonicus* (Mantero)

1. *Parastigmus argentinus* Antropov

Parastigmus argentinus Antropov 1992:99 ♀. Holotype: ♀ (not examined), ARGENTINA: Neuquén, Collón Curá, 19-I-1980. Willink, Fidalgo, Dominguez, Claps (LILLO).

Diagnosis.—The male is recognized by its red metasomal sternum II, longitudinally microsculptured scutum, and length of flagellomere I which is $0.75 \times$ length of pedicel. Males of other species have a first flagellomere length subequal to pedicel and/or microsculpture of scutum demonstrating no particular orientation. The metasoma of other species is black and may also prove to be black in other specimens of this species. The female is recognized by its biemarginate clypeal edge with median lobe developed.

Description.—Male. Length 3.5 mm.

Head. Flagellomeres without tyli. Ratio of pedicel to flagellomere I is 1:0.75. Head coarsely microsculptured, without shiny areas. Clypeus and subantennal area obscured by dense appressed setae which extend broadly up the inner orbits to a point $1.6 \times$ scapal length. Frons and vertex with sparse obscure punctures, appearing impunctate at low magnification. Ocelli closer to each other than to eyes; OOD $1.6 \times$ LOD. Genal punctures evanescent.

Mesosoma. Pronotum with transverse sulcus longitudinally carinate. Scutum longitudinally microsculptured; scutellum and mesopleuron above hypersternaulus microsculptured; sternopleural region

somewhat shiny, weakly microsculptured. Scutum without appressed setae; punctures sparse, evanescent; notaular grooves foveolate. Scutellum sparsely punctate, punctures evanescent. Scrobal sulcus absent. Mesopleuron impunctate. Hypersternaulus and omaulus weakly foveolate. Metapleuron shiny, weakly microsculptured. Propodeum with areolate sculpture over most of surface, sculpture finer toward metapleuron; dorsal enclosure not defined by a carina.

Metasoma. Microsculptured, punctate at apices of terga II–VI, more coarsely so on posterior terga; terga V and VI sparsely punctate over entire dorsal area. Tergum VII with ill-defined pygidial plate, punctured, shiny, impunctate apically. Setal density abruptly increasing on tergum IV to posterior metasoma.

Color. Ground color black. White: palpi, labrum, mandible except apex, scape ventrally, pronotal lobe, anterior spot on tegula. Brown to yellow-brown: antenna except ventral scape, fore leg beyond coxa, mid leg beyond coxa, hind leg except coxa and femur, tegula except anterior spot, stigma. Red: apices of metasomal terga I and II, sterna II, base of III and VII.

Female. Length 4 mm. Similar to male except as follows: ratio of pedicel to flagellomere I is 1:1.1. Clypeus almost devoid of setae and punctures, shiny, without microsculpture; apex biemarginate with lateral teeth prominent and median lobe developed. Inner orbits with several setae that do not obscure underlying

sculpture. Subantennal area without setae. Frons somewhat shiny, with weak microsculpture. Vertex posterior to ocelli, transversely microsculptured. OOD $2.2 \times \text{LOD}$. Upper frons and vertex sparsely punctate. Lower gena more densely punctate than upper gena, punctures 1–2 diameters apart near mandibular base. Scutum sparsely punctate. Mesopleuron shiny, without microsculpture; scrobal sulcus slightly impressed; sternopleural region closely punctate, punctures minute, 1–3 diameters apart. Pygidial plate broad, shiny, punctate on midline, more broadly punctate basally. Colored as in male but without red.

Material Examined (1♂, 1♀).—**ARGENTINA: Neuquén:** Collón Curá, 19-I-1980. Willink, Fidalgo, Dominguez, Claps.

Distribution (Map 6).—Argentina.

2. *Parastigmus huecuvus* Finnamore, new species

Derivation of Name.—Huecuvue, from Araucanian mythology (Chile), are spirits able to change into any form they wished for the purpose of doing evil, in this case creating confusion among taxonomists due to aberrant characters.

Diagnosis.—Males are distinguished from other *Parastigmus* by the entirely microsculptured mesosoma and black abdomen. Other species have a shiny sternopleural region, and the metasoma is in part red in *patagonicus*. The female is unique in the genus in having 4 subequally developed clypeal teeth and without a broad median emargination. The clypeus in females of other species has a broad median emargination in which the median teeth or lobe is recessed or absent resulting in prominent lateral teeth.

Description.—Male. Length 3.5 mm.

Head. Flagellomeres without tyli. Ratio of pedicel to flagellomere I is 1:0.9. Head entirely microsculptured. Clypeus and subantennal area obscured by dense appressed setae which extend along inner orbits to a point 1.5 times length of scape.

Punctures of frons and vertex sparse, evanescent. Ocelli closer to each other than to eyes; OOD $1.4\text{--}1.6 \times \text{LOD}$. Genal punctures evanescent.

Mesosoma. Entirely microsculptured. Pronotum with transverse sulcus longitudinally carinate; pronotal side longitudinally carinate. Scutum and scutellum sparsely punctate, with many large impunctate areas; microsculpture simple, not oriented in any direction. Notaular grooves deeply impressed, coarsely foveolate. Scrobal sulcus absent. Mesopleuron impunctate, without carinae except occasionally at lower posterior margin. Omaulus and hypersternaulus foveolate. Metapleuron microsculptured, without carinae, impunctate. Propodeal sculpture irregularly areolate on dorsal and posterior surface. Propodeal enclosure not evident. Propodeal side with sculpture evanescent toward metapleuron.

Metasoma. Microsculptured except tergum VII. Punctures of terga and sterna small, sparse, evanescent. Pygidial plate shiny medially, without microsculpture, 2 or 3 punctures laterally. Setal density increasing toward posterior metasoma.

Color. Ground color black. White: Mandible except apex, scape ventrally, pronotal lobe, anterior spot on tegula. Brown to yellow-brown: palpi, antenna except ventral scape, stigma, legs but coxae and femora tend to be darker brown and fore leg tends to be lighter yellow-brown.

Female. Length 4 mm. Similar to male except as follows: clypeus entirely, evenly setose although setae not obscuring underlying surface, shiny, microsculpture absent, with several relatively large punctures subapically along apex. Clypeal apex with 4 subequally developed teeth, without a broad median emargination. Subantennal area and inner orbits without setae. OOD $2 \times \text{LOD}$. Pygidial plate shiny, impunctate over lateral third; median third slightly raised, shiny, without microsculpture, irregularly punctate and irregularly, finely rugose.

Material Examined (3♂, 10♀).—Holotype: ♀, CHILE: Santiago—Cordillera, Reserva Río Clarillos 1–20-II-1989. R. Miller & L. Stange. Malaise Trap (FSCA). Paratypes: **CHILE: Concepción:** Concepc. 19/12 1907. P. Herbst (♀: 1 NMW). The 19/12 and the 7 in 1907 are inscribed in red ink on the specimen label, in the latter case the 7 is written over the 4 in 1904. Specimen bears a second label with the numbers 17 and 84. Concepc. 27/12 1907. P. Herbst (♂: 2 NMW). The 27/12 and the 7 are inscribed in red ink on the specimen label in the latter case the 7 in 1907 is written over the 3 in 1903 or the 4 in 1904. Concepc. 3–1908. P. Herbst (♂: 1 NMW). The 3 and 8 are inscribed in red ink, the latter over the 4 in 1904. **Santiago:** Cordillera, Reserva Río Clarillos 1–20-II-1989. R. Miller & L. Stange. Malaise Trap (♀: 5 FSCA, 2 PMA). Cordillera, Reserva Río Clarillos 21–28-II-1989. R. Miller & L. Stange. Malaise Trap (♀: 1 FSCA).

Distribution.—(Map 7). Chile.

3. *Parastigmus nina* Finnamore, new species

Derivation of Name.—Nina is a Quechua term meaning fire, referring to the red mesosoma of the holotype.

Diagnosis.—The short flagellomere I ($0.6\text{--}0.7 \times$ length of pedicel) distinguishes this species from others in the genus except males of *argentinus*. In all other species the length of flagellomere I equals $0.9\text{--}1.1$ of the pedicel length, except male of *argentinus* which differs from *nina* in its red second metasomal sternum. *Parastigmus nina* has a pedicel:flagellomere I ratio of $1:0.6\text{--}0.7$, black metasoma, and the mesosoma may be red or black, that of the female holotype is extensively red.

Description.—Male. Length 4 mm.

Head. Flagellomeres without tyli. Ratio of pedicel to flagellomere I is $1:0.7$. Head microsculptured except near frontal carina where microsculpture is evanescent. Clypeus and subantennal area obscured by dense appressed setae which extend

broadly up the inner orbits to a point almost twice the length of the scape. Frons and vertex irregularly punctate ($1\text{--}5$ diameters apart). Ocelli slightly closer to each other than to eyes; OOD $1.5 \times$ LOD. Genal punctures evanescent.

Mesosoma. Scutum, scutellum, mesopleuron, and upper metapleuron extensively shiny, microsculptured in part. Pronotum with transverse sulcus longitudinally carinate; side weakly carinate. Anterior quarter of scutum partially obscured by dense appressed setae, microsculptured; median and posterior areas of scutum shiny with evanescent microsculpture, punctures sparse, notaular grooves foveolate. Scutellum shiny, sparsely punctate anteriorly, microsculptured posteriorly. Scrobal sulcus absent. Mesopleuron immediately ventral to hypersternaulus, minutely punctured; elsewhere punctures sparse, evanescent. Hypersternaulus and omaulus weakly foveolate. Mesopleuron microsculptured posteriorly, mostly shiny anteriorly. Metapleuron microsculptured over most of surface except dorsal shiny patch. Propodeum coarsely microsculptured on side, finely areolate dorsally, posteriorly, and on lateral sphere. Propodeal enclosure not defined by a carina.

Metasoma. Microsculptured, impunctate except tergum VII. Sterna II–IV minutely punctate posteriorly. Pygidial plate ill-defined, shiny medially, without microsculpture, several punctures present laterally. Setal density gradually increasing toward posterior metasoma.

Color. Ground color black. White: mandible except apex, labrum, scape ventrally, pronotal lobe, anterior spot on tegula. Brown to yellow-brown: palpi, antenna except ventral scape, stigma, legs except coxae, hind leg is darker than other legs.

Female. Length $4.0\text{--}4.5$ mm. Similar to male except as follows: ratio of pedicel to flagellomere I is $1:0.6\text{--}0.7$. Clypeus sparsely setose, shiny, sparsely punctate with median bulge; apex broadly and deeply emarginate over median 0.45 ; lateral teeth

acute, prominent; median teeth absent. Inner orbits and subantennal area not setose. OOD $2.3 \times$ LOD. Mesosoma red or black, the holotype has a red mesosoma with black in the following areas: propodeal enclosure, mid ventral line, coxae, mid trochanter, mid femur, hind leg; otherwise colored as in the male. The ♀ paratype has the same color pattern as the male. Pygidial plate broad, shiny, sparsely punctate medially.

Material Examined (1♂, 2♀).—Holotype: ♀, ARGENTINA: Neuquén, Collón Curá 19-I-1980. Willink, Fidalgo, Dominguez, Claps (LILLO). Paratypes: ARGENTINA: Neuquén: Collón Curá 19-I-1980. Willink, Fidalgo, Dominguez, Claps (♂: 1 LILLO). Santa Cruz: 3 km s. Río Chico at Hwy. 3; XII-11-1966, 90m, E.I. Schlinger & M.E. Irwin (♀: 1 CAS).

Distribution (Map 8).—Argentina.

4. *Parastigmus patagonicus* (Mantero) new combination

Stigmus patagonicus Mantero 1901:199 ♂. Holotype*: ♂, Río Sta. Cruz, Silvestri (MCSN).

Diagnosis.—The male can be distinguished from all other species in the genus by the combination of a pedicel subequal to length of flagellomere I, and a shiny mesopleuron without microsculpture ventral to hypopleural area. The male of this species is superficially similar to *huecuvus* with which it shares a long first flagellomere. In addition to the mesopleural microsculpture the length of the petiole may be used to separate the two species; the petiole slightly shorter than tergum I in *huecuvus* and slightly longer than tergum I in *patagonicus*. The petiole length should be used with caution since it is subject to variation in closely related genera and has been excluded from descriptions for that reason. The number of specimens available for this genus is insufficient to determine variation in petiole length.

Females can be separated from other species in the genus by the combination of

the pedicel subequal in length to flagellomere I, and the broadly emarginate clypeus with prominent lateral teeth but without a median lobe.

Description.—Male. Length 4.5–5.0 mm.

Head. Flagellomeres without tyli. Ratio of pedicel to flagellomere I is 1:1. Head coarsely microsculptured, without shiny areas. Clypeus and subantennal area obscured by dense appressed setae which extend broadly up inner orbit to a point $1.5 \times$ length of scape. Upper frons and lower gena sparsely punctate. Ocelli closer to each other than to eye. OOD $1.6\text{--}1.7 \times$ LOD.

Mesosoma. Pronotum with transverse sulcus longitudinally carinate. Scutum and scutellum microsculptured, without appressed setae, sparsely punctate; notaular grooves foveolate. Mesopleuron shiny, without microsculpture ventral to hypopleural area which has evanescent microsculpture (may be longitudinally oriented). Punctures on sternopleural region minute, 3–4 diameters apart. Scrobal sulcus absent, indicated only by change in microsculpture. Hypersternaulus and omaulus weakly foveolate. Metapleural microsculpture evanescent. Propodeum microsculptured, areolate over most of surface except near metapleuron where it is carinate; propodeal enclosure not indicated by a carina.

Metasoma. Metasoma microsculptured except tergum VII, punctures evanescent but more evident on apices of apical terga. Pygidial plate ill-defined, shiny, sparsely punctate. Setal density gradually increasing toward posterior of metasoma.

Color. Ground color black. White: palpi, labrum, mandible except apex, scape ventrally, pronotal lobe, anterior spot on tegula. Brown to yellow-brown: antenna except scape ventrally, fore leg, mid leg, hind leg except coxa and femur, tegula except anterior spot.

Female. Length 6.0–6.5 mm. Similar to male except as follows: clypeus evenly covered with dense setae that partially ob-

scure sculpture beneath and extend up inner orbit to a point subequal to length of scape. Clypeus without microsculpture, shiny, punctures minute and sparse. Clypeal apex broadly emarginate, lateral teeth prominent, median lobe (teeth) reduced to a small mid point. Subantennal area without setae. OOD 1.8–1.9 × LOD. Mesosoma with scrobal sulcus slightly more impressed than in male. Propodeum more coarsely areolate than male. Pygidial plate broad, shiny with submedian puncture row that converges apically with the median.

Material Examined (5♂, 2♀).—**ARGENTINA: Catamarca:** Andahuallas 2000m. **Santa Cruz:** Río Santa Cruz (Type locality). **Tucuman:** Amaicha. Amaicha del Valle 1900m.

Distribution (Map 9).—Argentina.

ARAUCASTIGMUS Finnamore,
new genus
(Figs. 12–15)

Derivation of Name.—The genus is named after the Araucanian people of Chile the country of origin of most known specimens.

Diagnosis.—The combination of an acetabular carina present, hind wing media diverging just before cu-a and the mesosoma (except propodeum) without microsculpture will separate this genus from all others in the Stigmina.

Description.—Head. Labrum quadri-

lobed with a narrow deep median emargination. Mandible with apex bidentate in male, tridentate in female; apicoventral tooth acute in female; inner basal tooth absent. Clypeal apex in male without bevelled modification, in female with 4 teeth. Interantennal tubercle absent. Frontal carina present, simple. Vertex with micro-pore field present, diffuse. Inner orbits converging below. Eye not margined by a carina. Occipital carina present, simple, complete, and separated from hypostomal carina.

Mesosoma. Scutum without median groove, notaular grooves normal, short, not elongate. Acetabular carina absent, omaulus curving forward toward prothorax. Scrobal sulcus absent. Hypoepimeral area without coarse sculpture. Mid basitarsus of male unmodified, as long or longer than next 3 tarsomeres combined. Hind tibia with 2 or 3 spines on posterior margin. Fore wing with setae in cellular areas. Hind wing media diverging before cu-a; submedian cell of normal size, not reduced.

Metasoma. Petiole carinate. Pygidial plate narrow, absent in male. Digitus somewhat elongate; cusps with a large lobe bearing several teeth.

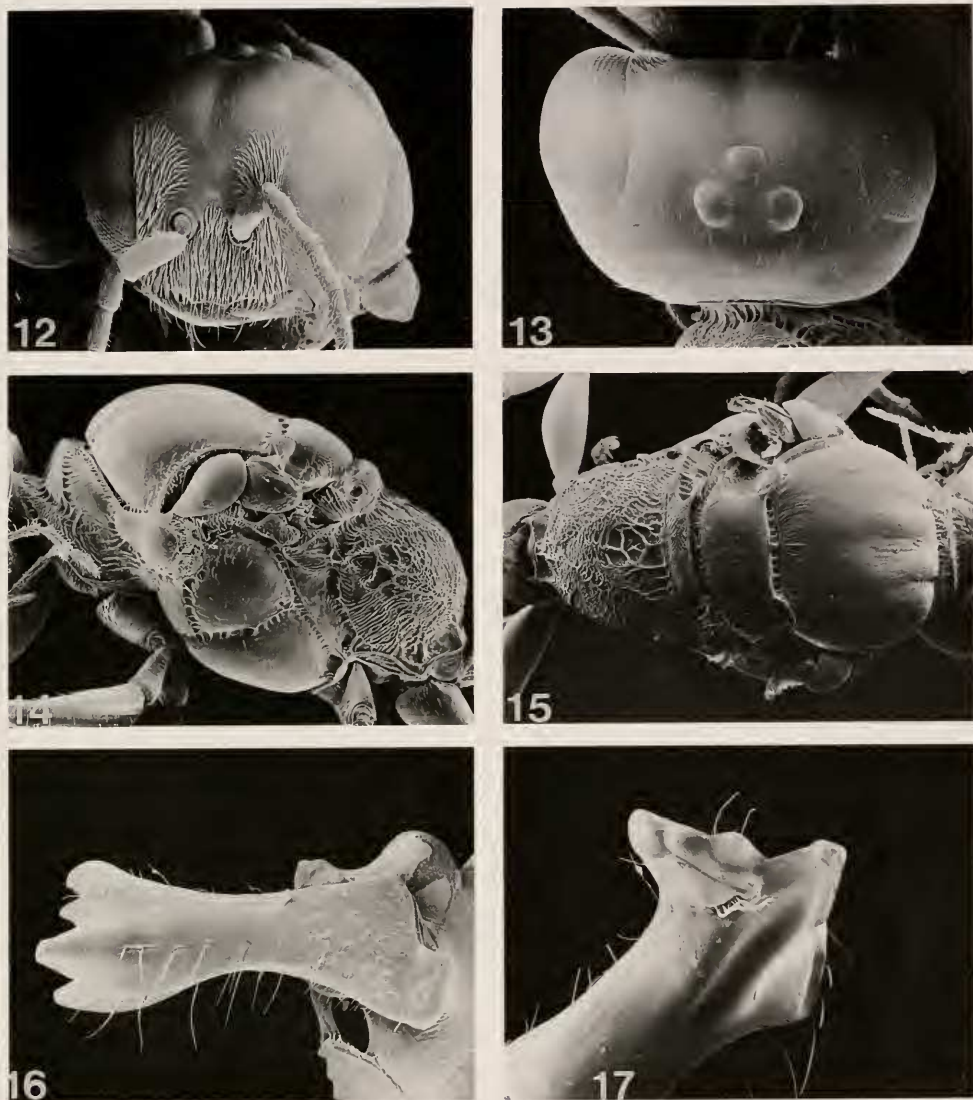
Type Species.—*Araucastigmus glabratus* (Kohl), new combination.

Distribution (Map 35).—Southern Neotropical: Chile.

Species Transferred.—*Stigmus glabratus* Kohl.

KEY TO SPECIES OF ARAUCASTIGMUS

- 1 Propodeum sculptured throughout, area adjacent to metapleuron microsculptured (Figs. 14, 15) 2. *masneri* Finnamore, new species
- 1' Propodeal side with basal shiny area adjacent to metapleuron 2
- 2 Propodeum microsculptured, shiny without microsculpture along mid dorsal line (outside enclosure) in male and also on mid posterior line in female 3. *yanillus* Finnamore, new species
- 2' Propodeum with sculpture in addition to microsculpture at least on dorsolateral areas in male; female without shiny areas on propodeum other than adjacent to metapleuron ..
..... 1. *glabratus* (Kohl)



Figs. 12–17. *Araucastigmus* and *Paracrabro*. 12, *Araucastigmus masneri* ♂, head, frontal view. 13, *A. masneri* ♂, head, dorsal view. 14, *A. masneri* ♂, mesosoma, lateral view. 15, *A. masneri* ♂, mesosoma, dorsal view. 16, *Paracrabro froggatti* ♀, mandible, outer view. 17, *Paracrabro froggatti* ♀, mandible, inner view.

1. *Araucastigmus glabratus* (Kohl),
new combination

Stigmus glabratus Kohl 1905:358 ♀. Holotype*:
♀, CHILE: Corral [Coul?], 3–1904, P. Herbst
(NMW).

Diagnosis.—Propodeum with shiny area
adjacent to metapleuron and with both
microsculpture and sculpture at least on
dorsolateral areas. Other species are either

microsculptured throughout or macro-
sculpture is absent or shiny areas are
much more extensive.

Description.—Male. Length 3.2–5 mm.

Head. Flagellomeres without tyli. Head
shiny, mostly without microsculpture,
sparsely punctate. Clypeus, subantennal
area and inner orbit obscured by dense
appressed setae which extend broadly up
inner orbit to a point $1.5 \times$ length of scape.

Frons impunctate, weakly microsculptured. Vertex transversely microsculptured. Ocelli closer to each other than to eyes. OOD $1.2\text{--}1.3 \times \text{LOD}$.

Mesosoma. Pronotal transverse carina foveolate laterally; transverse sulcus unsculptured; side irregularly carinate. Scutum and scutellum microsculptured. Scutum usually with a transverse row of microcarinae next to posterior margin; punctation variable, ranging from small sparse pinpricks to larger more dense (3–4 diameters apart) punctures more or less concentrated in the notaular region; anterior scutal margin nearly contiguously punctate between notaular grooves. Scutellum sparsely punctate on disc. Mesopleuron shiny, microsculpture at most weakly evident, nearly impunctate; scrobal sulcus absent; hypersternulus and omaulus weakly foveolate. Metapleuron impunctate, weakly microsculptured. Propodeal side shiny adjacent to metapleuron, otherwise microsculptured and finely areolate. Propodeal enclosure weakly defined, not carinate.

Metasoma. Weakly microsculptured. Punctures evanescent on terga I–III; posterior band of punctures on terga IV–VII that increases in width and puncture density towards posterior metasoma. Sterna minutely punctured.

Color. Ground color black. White to cream: palpi, mandibles except apically, antenna ventrally except apical flagellomeres, pronotal lobe, tegula, fore leg, mid leg except base of coxa and median area of femur, hind leg except base of coxa and basal $\frac{1}{5}$ of femur. Yellow-brown: apical flagellomeres of antenna, base of mid and hind coxae, median area of mid femur, basal $\frac{1}{5}$ of hind femur. Orange: apex of tergum VII of metasoma.

Female. Length 4–6 mm. Similar to male except as follows: clypeus without microsculpture, evenly punctured and setose, setae not obscuring underlying sculpture; punctures small about 1–2 diameters apart; apex with 2 median teeth separated by a shallow emargination; setae extend from

clypeus over subantennal area and up inner orbit to a point slightly greater than that of scapal apex. OOD $1.8\text{--}2.0 \times \text{LOD}$. Pygidial plate present, microsculptured, with several punctures. Antenna beyond pedicel brown; coxae, femora, and hind tibia suffused with brown; remaining area of legs more yellowed than in male. Apex of metasomal tergum VI orange.

Material Examined (26♂, 43♀).—**ARGENTINA:** Neuquén: Pucara, Lago Lacar. Pucara, P. Nac. Lanin. San Martin Andes. **CHILE:** Arauco: Contulmo, Palo Botado. Aysen: Lago Frio. Puerto Cisnes. Cautín: Afunahue Villarrica. Chiloe: Chiloe Island, Dalcahue. Curico: Cord. Curico, El Coigo. Cubillo, C. Curico. Estero La Juala, Los Quenes, Cord. Curico. **Los Lagos:** Corral (type locality). **Malleco:** P. N. Contulmo. Victoria, 4km s., 300m. **Nuble:** Las Trancas, Cord. Nuble (Chillan). **O'Higgins:** Graneros. **Santiago:** El Canelo. Lo Canas. **Talca:** Altos de Vilches, 1200m. **Valparaiso:** Los Andes. Vina del Mar. Valparaiso.

Distribution (Map 10).—Argentina, Chile.

2. *Araucastigmus masneri* Finnamore, new species

Derivation of Name.—The species is named in honour of Lubomir Masner, collector of half the known specimens.

Diagnosis.—Propodeum without shiny areas. Other species in the genus have a shiny area on the propodeum adjacent to the metapleuron.

Description.—Male. Length 4.0–5.5 mm.

Head. Flagellomeres without tyli. Head sparsely punctate, shiny, usually without microsculpture except on frons but larger specimens have evanescent microsculpture on vertex and gena. Clypeus and subantennal area obscured by dense appressed setae which extend up inner orbit to a point slightly greater than height of scape. Frons impunctate, microsculptured. Vertex minutely and sparsely punctate. Ocelli closer to each other than to eyes. OOD $1.8\text{--}1.9 \times \text{LOD}$.

Mesosoma. Pronotal transverse carina

foveolate laterally, transverse sulcus unsculpted; pronotal side with a few short carinae. Scutum with contiguous punctures between notaular grooves near anterior margin, otherwise impunctate or nearly so; shiny, without microsculpture; posterior margin weakly longitudinally microcarinate; notaular groove deeply impressed, foveolate. Scutellum shiny on anterior half, microsculptured on posterior half; with several scattered punctures on transverse midline. Mesopleuron shiny, without microsculpture, punctures sparse, obscure; scrobal sulcus absent. Hypersternaulus and omaulus foveolate. Metapleuron weakly microsculptured, impunctate. Propodeum without shiny areas, entirely microsculptured; evanescent, irregular, areolae on lateral spheres; propodeal enclosure not defined by a carina, with irregular carinae medially and on anterior margin.

Metasoma. Terga dull, microsculptured, punctures evanescent; posterior metasoma more shiny with punctures forming more or less discrete apical bands on terga. Sterna microsculptured, impunctate.

Color. Ground color black. White: palpi, mandible except apex, pronotal lobe, anterior spot on tegula. Brown to yellow-brown: scape, pedicel, at least flagellomeres I–V and occasionally I–XI, tegula except anterior spot, trochanters, fore and mid tibiae and tarsi, occasionally bases of sterna IV, V and apices of VI and VII.

Female. Length 4.5–5.5 mm. Similar to male except as follows: clypeus shiny, evenly punctured and setose, setae not obscuring underlying sculpture; punctures minute, 2–3 diameters apart. Clypeal apex with 2 teeth separated by shallow median emargination. Subantennal area less densely setose than clypeus. OOD $2.0\text{--}2.1 \times$ LOD. Scutum and mesopleuron more coarsely punctate than in male. Pygidial plate weakly microsculptured, with several punctures. Flagellum of antenna brown to black, mid tibia occasionally black, sterna black.

Material Examined (10♂, 20♀).—Holo-

type: ♂, CHILE: Cautín, Conguillio National Park, 1150m 4-II-1988 L. Masner, *Araucaria* [*Araucaria*?, *Araucariaceae*], *Nothofagus* [Fagaceae] (BRD). Paratypes: **ARGENTINA**: Neuquén: Lanín, Pucara 15-III-1971 Schajovskoy (♀: 4 IIES). **CHILE**: **Arauco**: Pichinahuel, Cord. Nahuelbuta 20-28-I-1959 L. Peña (♂: 1 BRD). **Aysen**: Lago Frio 20/23-I-61 L. Peña (♂: 1 MCZ). **Cautín**: same data as holotype (♂: 2 BRD, 2 PMA; ♀: 4 BRD, 5 PMA). **Los Lagos**: Osorno, Puyehue Nat. Pk., Antillanca, 1200m 16-II-1988 L. Masner, *Nothofagus* [Fagaceae] near treeline (♂: 1 BRD). **Magallanes**: Laguna Amarga, 12–60 Peña (♀: 1 IIES). Laguna Amarga, Natales XII-14–21–60 Luis Peña (♀: 1 OSU). **Malleco**: Cord. de las Raices, 40km e. Curacautín 6–7-II-1979, 1200m D. & M. Davis & B. Akerbergs (♀: 1 USNM). Curacautín, R. Blanco II-64 Luis E. Peña (♂: 1 AEI). Icalma, 31-XII-1958 Luis E. Peña (♀: 1 BRD). Liucura 1800m, Jan. 1959 L.E. Peña (♀: 1 OSU). **Nuble**: Las Trancas 1600m 19–22–1979 (♀: 1 PMA). Las Trancas, Chillán I-19–22–1979, 1600m L. Peña (♀: 1 AEI). **O'Higgins**: Graneros 1100m 4-III-62 Peña (♀: 1 MCZ). **Valdivia**: 30km w. La Unión, Las Traucas 500m 8–11-II-1988 PT, L. Masner (♂: 1 BRD).

Distribution (Map 11).—Argentina: Neuquén. Chile.

3. *Araucastigmus yanillus* Finnamore, new species

Derivation of Name.—The name *yanillus* is derived from two Quechua terms, *yana* meaning black and *illay* meaning bright or shiny, in reference to the shiny black appearance of this species.

Diagnosis.—The extensive shiny areas in the female propodeum and in the male propodeum, the lack of sculpture overlying microsculpture, and the lateral shiny area next to the metapleuron will separate this species from all others in the genus. Other species have the propodeum entirely microsculptured or they have sculpture on at least lateral spheres.

Description.—Male. Length 4 mm.

Head. Flagellomeres without tyli. Head sparsely punctate, shiny, without microsculpture except sometimes evanescent microsculpture on gena. Clypeus and subantennal area obscured by dense appressed setae which extend up inner orbit to a point $1.1 \times$ length of scape. Lower frons impunctate, shiny; upper frons with several scattered punctures. Vertex sparsely punctate. Ocelli closer to each other than to eyes. OOD $1.5\text{--}1.6 \times$ LOD.

Mesosoma. Pronotal transverse carina foveolate laterally, several longitudinal carinae sometimes present near median region of transverse sulcus. Scutum with variable, non-contiguous punctures and a few fine, transverse microcarinae on anterior margin between notaular grooves; microsculpture present between admedian lines. Scutum otherwise shiny, without microsculpture, mostly impunctate, few punctures clustered posterior to notaular groove; notaular groove deeply impressed, foveolate; posterior margin of scutum smooth, without transverse row of longitudinal carinae. Scutellum shiny on anterior half, microsculptured on posterior half; a few punctures along transverse median discal area. Mesopleuron shiny, impunctate above sternopleural region; scrobal sulcus absent. Hypersternaulus foveolate; omaulus not foveolate, usually evanescent to absent toward hypersternaulus but continued ventrally. Metapleuron shiny, without microsculpture. Propodeum shiny laterally adjacent to metapleuron, otherwise microsculptured without raised lines (sculpture) except on median area of propodeal enclosure where several more or less transverse carinae are usually evident. Propodeal enclosure not defined by a carina.

Metasoma. Weakly microsculptured, somewhat shiny compared to other species; punctures minute, sparse, evanescent, not forming apical bands on posterior terga. Sterna microsculptured, impunctate.

Color. Ground color black. White: palpi, mandible except apically, pronotal lobe,

anterior spot on tegula, trochanters, fore and mid tarsi, coxae ventrally. Yellow-brown: scape, pedicel, flagellomeres I–VII ventrally, coxae dorsally, femora, tibiae, hind tarsus, and sterna beyond II more or less suffused.

Female. Length 4.5–5.5 mm. Similar to male except as follows: clypeus sparsely and evenly setose, more sparsely setose than in other species, punctures minute with several larger punctures medially. Clypeal apex with 2 teeth separated by shallow median emargination. Subantennal area without setae. OOD $2.1 \times$ LOD. Propodeum with sculpture on lateral spheres variable from nearly completely shiny (most specimens) to almost entirely microsculptured, without sculpture overlying microsculpture; area adjacent to metapleuron shiny. Pygidial plate narrow with median area minutely punctate. Mid and hind legs brown except trochanters.

Material Examined (8♂, 10♀).—Holotype: ♀, CHILE: Cautín: Conguillio National Park 1150m 4-II-1988 L. Masner, *Araucaria* [*Araucaria*?, *Araucariaceae*], *Nothofagus* [*Fagaceae*] (BRD). Paratypes: **ARGENTINA: Neuquén:** Pucara (S.M. Andes) XII-6-16-1968 C.C. Porter (♂: 1 MCZ). **CHILE: Arauco:** Pichinahuel, Cord. Nahuelbuta 10-20-I-1959 L. Peña (♀: 1 BRD). **Cautín:** same data as holotype (♂: 5 BRD, 2 PMA; ♀: 1 BRD, 5 PMA). **Curico:** El Coigo Jan-1961 J. Foerster (♀: 1 BRD). **Nuble:** Las Trancas, 1400m Chillan XII-19-21-1983 Luis Peña (♀: 1 AEI).

Distribution (Map 12).—Argentina: Neuquén. Chile.

PARACRABRO Turner (Figs. 16, 17)

Paracrabro Turner 1907:274. Type species: *Paracrabro froggatti* Turner, 1907 by original designation and monotypy.

Diagnosis.—The presence of an acetabular carina, hind wing media diverging just before cu-a, and the lack of a discrete micropore field on the vertex will separate this genus from all others in the Stigmina.

Description.—Head. Labrum weakly quadrilobed (appears bilobed), median lobes evanescent. Mandible with apex bidentate in male, pentadentate in female; apicoventral tooth in female acute; inner basal tooth absent. Clypeal apex in male without bevelled modifications; female clypeus with 4 apical teeth although median teeth are greatly reduced imparting a bidentate appearance. Interantennal tubercle present, protruding. Frontal carina present as a simple raised line immediately above interantennal tubercle. Vertex with loose association of pits rather than micropore field; pits shifted anteriorly in female. Inner orbits parallel in female, converging below in male. Eye margined by a carina on inner orbit in female, entirely margined in male. Occipital carina foveolate, more or less raised ventrally, not intersecting hypostomal carina.

Mesosoma. Scutum without median groove, notaular groove not elongate. Acetabular carina present, omaulus intersecting acetabular carina, subomaulus absent. Scrobal sulcus absent in female, evanescent in male. Hypoepimeral area without coarse sculpture except in area of scrobal sulcus in male, microsculptured only. Mid basitarsus of male flattened, curved with posterior subapical expansion. Hind tibia excluding apex, with 4 posterior spines in female, 2 in male. Fore wing cellular area without setae in male, setae present in female. Hind wing media diverging at cu-a; hind wing submedian cell not reduced, of normal size.

Metasoma. Petiole rounded, carinae present apically and basally. Pygidial plate narrow, trough-like, absent in male. Male genitalia unusually elongate relative to other genera in the subtribe, digitus elongate relative to cuspis.

Distribution (Map 13).—Australia.

Paracrabro froggatti Turner

Paracrabro froggatti Turner 1907:275 ♀. Holotype ♀ (not examined), Australia: Victoria.

Description.—See generic description above.

Material Examined (1♂, 1♀).—**AUSTRALIA: New South Wales:** Elizabeth Beach, 21km s. Forster. **Western Australia:** Gascoyne Exp. Sta., Carnarvon.

Distribution (Map 13).—Australia.

AYKHUSTIGMUS Finnermore, new genus (Figs. 18–29)

Derivation of Name.—Aykhu is a Quechua term meaning extravagant or fancy in reference to the unusually complex sculpturing found in members of this genus.

Diagnosis.—The coarsely sculptured mesopleuron will separate this genus from all others in the Stigmina.

Description.—Head. Labrum quadrilobed, with a shallow broad median emargination. Mandible with apex in male bidentate, in female tridentate; apicoventral tooth in female acute; inner basal tooth absent. Clypeal apex in male without bevelled modification; female clypeal apex with 4 teeth. Interantennal tubercle absent. Frontal carina absent. Vertex with micropore field between lateral ocellus and eye margin. Inner orbits converging below. Eye margined by a strong carina. Occipital carina present, complete, not joining hypostomal carina, simple in female, raised and foveolate in male.

Mesosoma. Scutum with median groove usually absent but occasionally evanescent posteriorly; notaular groove normal, not elongate. Acetabular carina present, intercepted by omaulus. Scrobal sulcus present, evanescent. Hypoepimeral area coarsely sculptured. Mid basitarsus in male unmodified. Posterior margin of hind tibia with 2 or 3 spines. Fore wing with setae absent from cellular area. Hind wing with media diverging before or after cu-a; submedian cell of normal size, not reduced.

Metasoma. Petiole carinate. Pygidial

plate narrow, absent in male. Genitalia with digitus elongate, acute, cuspis (lobed?) with tooth.

Type Species.—*Aykhustigmus patanawi* new species.

Distribution (Map 36).—Neotropical, south of the Brazilian Highlands although a single record exists for Venezuela, possibly an introduced species or mislabelled specimen.

KEY TO SPECIES OF *AYKHUSTIGMUS*

(Male of *A. phasti* is unknown)

- | | |
|--|---|
| 1 Males | 2 |
| 1' Females | 4 |
| 2 Hind wing media diverging before cu-a (Fig. 48); vertex and gena striatopunctate (Figs. 19, 21); frons irregularly carinate; scutum closely and coarsely punctate to striatopunctate posteriorly (Fig. 23) | 2. <i>patanawi</i> Finnamore, new species |
| 2' Hind wing media diverging after cu-a (Fig. 49); head at most with microsculpture; scutum with smaller more widely separated punctures | 3 |
| 3 Frons with pair of small swellings anterior to mid ocellus on each side of frontal carina | 1. <i>fritzi</i> Finnamore, new species |
| 3' Frons smoothly rounded, without swellings | 4. <i>warawa</i> Finnamore, new species |
| 4 Hind wing media diverging before cu-a (Fig. 48); vertex transversely striatopunctate; upper frons striatopunctate | 2. <i>patanawi</i> Finnamore, new species |
| 4' Hind wing media diverging after cu-a (Fig. 49); frons and vertex at most with microsculpture | 5 |
| 5 Frons with a pair of broad swellings anterior to mid ocellus that are visible in lateral profile | 1. <i>fritzi</i> Finnamore, new species |
| 5' Frons evenly rounded, without swellings | 6 |
| 6 Clypeus with 4 apical teeth (Fig. 24); scutum microsculptured on anterior ¼ to ½, shiny and punctate to striatopunctate on posterior half (Fig. 29) | 4. <i>warawa</i> Finnamore, new species |
| 6' Clypeus with 2 apical teeth; scutum shiny, without microsculpture, carinate on median third | 3. <i>phasti</i> Finnamore, new species |

1. *Aykhustigmus fritzi* Finnamore, new species

Derivation of Name.—The species is named in honour of Manfredo A. Fritz, collector of most of the specimens I have seen of the genus.

Diagnosis.—The hind wing media diverging after cu-a, swellings on the upper frons, and microsculpture on the anterior scutum will distinguish this species from all others in the genus.

Description.—Male. Length 4 mm.

Head. Flagellomeres without tyli. Clypeus and subantennal area obscured by dense appressed setae that extend up inner orbits to a point about ¾ length of scape. Eye margined by a coarse carina

that is interrupted ventrally near base of mandible. Carina foveolate, except on vertex and separated from outer orbit by a distance subequal to basal width of mandible. Frons microsculptured and impunctate on lower face; shiny, with evanescent microsculpture on upper surface to lateral ocellus where it is sparsely punctate with punctures at least 3 diameters apart. Upper frons with a swelling on each side of frontal line that is just visible in lateral profile. Vertex microsculptured, with a circular depression on midline posterior to lateral ocelli. Posterior vertex with an evanescent transverse ridge (posterior to circular depression) connecting outer orbital carinae. Ocelli closer to each other than to

eyes. OOD $1.8 \times$ LOD. Gena microsculptured, punctures evanescent; irregular evanescent carinae radiate from occipital carina on lower genal area. Occipital carina considerably raised, coarsely foveolate to mid ventral line.

Mesosoma. Pronotum with transverse carina greatly raised, toothed at lateral end; carina continued on side to antero-ventral corner which is produced anteriorly as a tooth that surpasses dorsolateral tooth in size. Pronotum with transverse sulcus longitudinally carinate; setae sparse, not obscuring sculpture. Pronotal side longitudinally carinate. Scutum microsculptured anteriorly, shiny evanescent microsculpture posteriorly. Scutum between notaular grooves, striatopunctate, elsewhere sparsely punctate. Scutellum shiny anteriorly, microsculptured posteriorly, with a foveolate transverse sulcus on lateral disc. Mesopleuron coarsely areolate from subalar fossa to sternopleural region. Scrobal sulcus indicated by slight depression. Hypersternaulus and omaulus coarsely foveolate. Mesosternum microsculptured, punctate next to areas of areolate sculpture on sternopleural region. Metapleuron microsculpture evanescent with a few irregular longitudinal carinae. Hind wing media diverging after cu-a. Propodeum coarsely areolate, except area next to metapleuron which is weakly carinate.

Metasoma. Terga shiny, without microsculpture, impunctate. Sterna shiny, without microsculpture, with several punctures on lateral margins.

Color. Ground color black. White: pronotal lobe. Yellow-brown: palpi, mandible except apex, antenna, tegula, wing veins, stigma, legs.

Female. Length 3.5 mm. Similar to male except as follows: clypeus with 2 median teeth separated by a deep semicircular emargination; setose, although less so than male; setae partially obscuring densely punctate surface. Subantennal area and inner orbits sparsely setose. Inner

orbits margined by an evanescent, non-foveolate carina. Eye elsewhere not margined by carina. Frons between swellings and lateral ocelli, shiny, weakly microsculptured with coarse sparse punctures (3 or more diameters apart). Vertex without circular depression or transverse ridge but with frontal line continued as a sulcus on midline posterior to ocelli. OOD $1.7 \times$ LOD. Gena with coarse sparse punctures. Occipital carina simple, not raised or foveolate. Pronotum with teeth less prominent than in male. Metasomal terga and sterna shiny with sparse punctures; sternum VI densely punctate. Pygidial plate narrow, shiny, bisected by a longitudinal ridge, with several coarse punctures.

Material Examined (1♂, 2♀).—Holotype: ♂, PARAGUAY: S. Bernardino, Mitte Decbr., Fiebrig (NMW). Paratypes: **BOLIVIA:** Km 335 de Cochabamba a Santa Cruz, Fritz -Martinez Col. (♀: 1 IIES). **BRAZIL: Estado do Ceara:** Ceara, Baturite 17–6–1908, Ducke (♀: 1 MPEG).

Distribution (Map 14).—Brazil: Ceara. Bolivia, Paraguay.

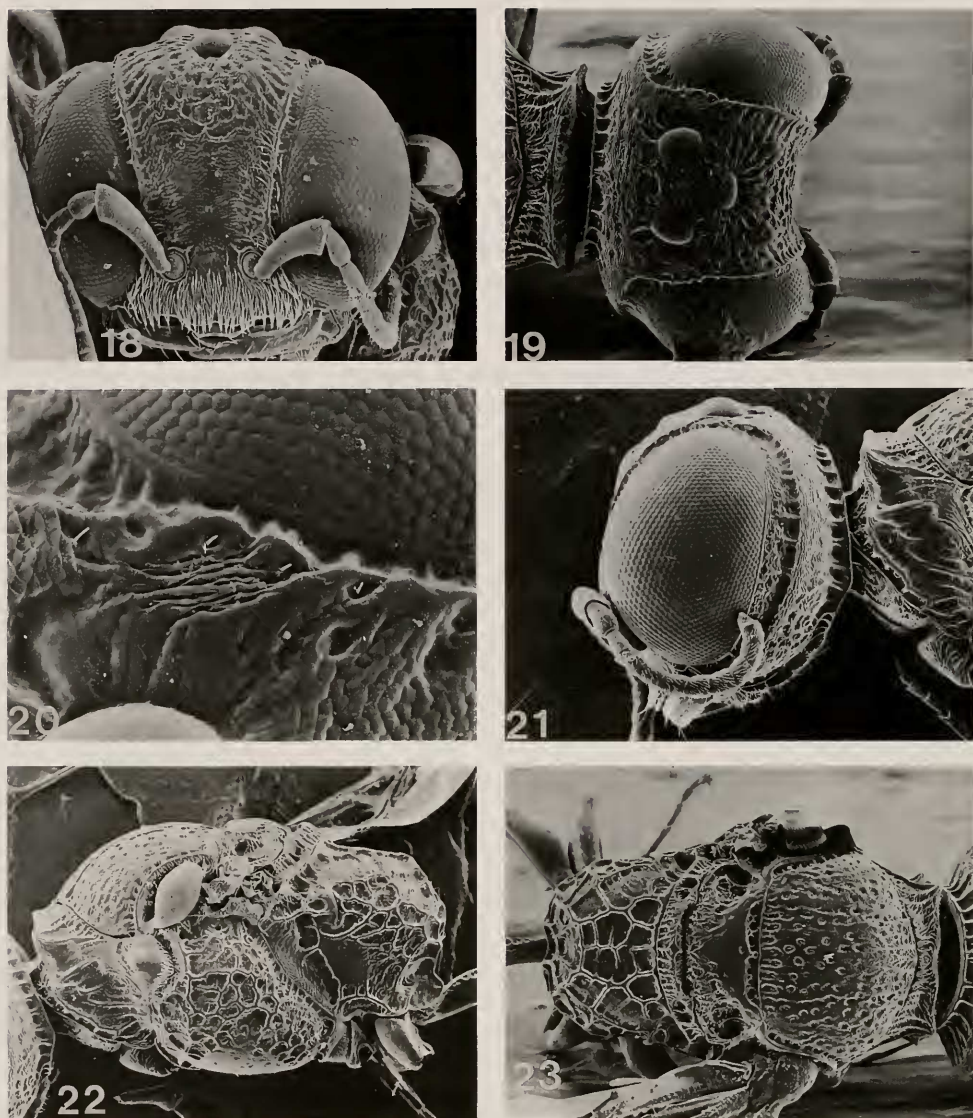
2. *Aykhustigmus patanawi* Finnamore, new species

Derivation of Name.—The species epithet is derived from two Quechua terms, “pata” meaning margin and “nawi” meaning eye, in reference to the margined eye of this species.

Diagnosis.—Hind wing media diverging before cu-a and vertex with transverse carinate sculpture.

Description.—Male. Length 4.2 mm.

Head. Flagellomeres without tyli. Clypeus and subantennal area obscured by dense appressed setae that extend narrowly up inner orbit to a point about $1\frac{1}{2}$ height of scape. Eye margined by a coarse foveolate carina that is interrupted ventrally at base of mandible. Carina separated from mid point of outer orbit by a distance subequal to basal width of mandible. Frons with frontal surface impunctate, microsculptured; irregular transverse ca-



Figs. 18–23. *Aykhustigmus patanawi* ♂. 18, head, frontal view. 19, head and prothorax, dorsal view. 20, micropore field between lateral ocellus and compound eye. 21, head, lateral view. 22, mesosoma, lateral view. 23, mesosoma, dorsal view.

rinae laterally next to inner orbital carina. Upper frons with coarse more or less irregular striatopunctate sculpture radiating from mid ocellus, punctures less than 1 diameter apart; small swelling on either side of mid line just anterior to mid ocellus. Vertex densely microsculptured with large, median, circular depression poste-

rior to lateral ocelli; several short carinae radiating from lateral ocellus. Posterior vertex with a series of 3 or 4 transverse, striatopunctate ridges extending between outer orbits posterior to orbital carinae. OOD $0.9\text{--}1.3 \times \text{LOD}$. Gena entirely carinate or lower area areolate, sculpture in either case continuous from occipital ca-

rina to hypostomal carina and outer orbital margin. Occipital carina considerably raised, lamella-like, coarsely foveolate to mid ventral line.

Mesosoma. Pronotum with transverse carina considerably raised, toothed at lateral end; carina continued ventrally on propodeal side to anteroventral corner which is produced anteriorly as tooth subequal in size to dorsolateral tooth. Pronotum with transverse sulcus longitudinally carinate; setae sparse, not obscuring sculpture. Pronotal side with irregular longitudinal carinae. Scutum microsculptured anteriorly and in depressions medially and posteriorly; striatopunctate, punctures coarse, variable from relatively sparse, about 1 diameter apart on disc to nearly contiguous; notaular groove deeply impressed, foveolate, continued over half length of scutum. Scutellum microsculptured, with foveolate transverse sulcus on mid lateral disc. Mesopleuron coarsely areolate from subalar fossa to sternopleural region. Scrobal sulcus indicated by slight depression. Hypersternaulus and omaulus coarsely foveolate. Mesosternum microsculptured, sparsely punctate. Hind wing media diverging before cu-a. Metapleuron microsculptured, few short carinae on posterior margin. Propodeum microsculptured and coarsely areolate, except for side next to metapleuron which is without areolae and partially without microsculpture.

Metasoma. Terga shiny with slight oily sheen, appearing impunctate on anterior terga (punctures minute, sparse, evanescent) but punctures increasing in size and density on posterior terga. Sterna shiny with slight oily sheen, punctures sparse throughout.

Color. Ground color back. White: pronotal lobe. Yellow-brown to brown: palpi, mandible except apex, antenna, legs, tegula, wing veins, stigma.

Female. Length 4.5 mm. Similar to male except as follows: clypeus with 2 median teeth separated by a deep semicircular

notch; setae dense, obscuring underlying sculpture. Setae less dense on subantennal area and inner orbit. Inner orbit margined by a non-foveolate carina that extends to vertex. Outer orbit without carina. Frons with lower area impunctate, densely microsculptured; upper area with evanescent microsculpture, shiny, obscurely striatopunctate; carinae, if present, radiating from mid ocellus anteriorly. Frons with small swelling on either side of mid line. Vertex with reduced circular depression posterior to ocelli (not evident in 1 specimen). Vertex densely microsculptured, with a series of irregular, transverse fine carinae between and posterior to outer orbits. Gena carinate and punctate near mandible, elsewhere microsculptured. OOD $1.9\text{--}2.1 \times \text{LOD}$. Occipital carina simple, complete, not raised or foveolate. Punctuation of metasoma as in male except sternum VI densely punctate. Pygidial plate narrow, shiny, bearing a lateral row of punctures.

Material Examined (1♂, 3♀).—Holotype: ♂, ARGENTINA: B. Aires, La Plata (Fac. Agronomia) X-XI-68 C. Porter (MCZ). Paratypes: ARGENTINA : Buenos Aires: Moreno, Fritz (♀: 1 IIES). Moreno, 12-73 Fritz (♀: 1 IIES). Tigre XI-39 Viana Leg. (♀: 1 IIES).

Distribution Map 15.—Argentina: Buenos Aires.

3. *Aykhustigmus phasti* Finnamore, new species

Derivation of Name.—Phasti is a Quechua term meaning naked or bare in reference to the lack of microsculpture on the scutum and the resulting naked appearance.

Diagnosis.—Male unknown. Female: the absence of microsculpture on the scutum will distinguish this species from others in the genus. In addition the hind wing media diverges after cu-a, the vertex is without a transverse carinae, and the clypeal apex has 2 teeth.

Description.—Female. Length 4 mm.

Head. Clypeus with 2 teeth on apical margin separated by a deep U-shaped notch; surface partially obscured by dense appressed setae which extend up subantennal area and narrowly up inner orbit to about $\frac{3}{4}$ height of scape. Inner orbit with non-foveolate carina that is evanescent toward vertex. Outer orbit not margined. Frons microsculptured on scapal basin, impunctate; upper frons more or less shiny with evanescent microsculpture, punctures sparse. Vertex sometimes with poorly defined depression posterior to lateral ocelli on mid line or depression absent; densely microsculptured in contrast to upper frons. OOD $1.8-1.9 \times$ LOD. Gena microsculptured, punctate toward mandibular base. Occipital carina simple, complete, not raised or foveolate.

Mesosoma. Pronotum with transverse carina considerably raised, lateral end forming right angle that continues ventrally on carinate pronotal side to anteroventral corner which is produced as a small tooth. Pronotum with transverse sulcus longitudinally carinate. Scutum shiny, without microsculpture except weakly at extreme anterolateral corner, median third (between notaular grooves) striatopunctate; lateral area punctate, usually more densely punctate next to notaular groove. Scutellum shiny or weakly microsculptured anteriorly, microsculptured posteriorly; a foveolate, transverse sulcus on mid lateral disc; punctures few, present on anterolateral disc. Mesopleuron coarsely areolate from subalar fossa to sternopleural region. Scrobal sulcus indicated by a slight depression. Hypersternaulus and omaulus coarsely foveolate. Mesosternum microsculptured, sparsely punctate. Metapleuron weakly microsculptured, a few short carinae on posterior margin. Hind wing media diverging after cu-a. Propodeum with microsculpture evanescent or absent over most of its surface; coarsely areolate, except next to metapleuron which is irregularly carinate.

Metasoma. Terga shiny; punctures

sparse, evanescent on anterior terga, more apparent on posterior terga. Pygidial plate with slight raised median basal ridge. Sterna shiny, sparsely punctate except sternum VI which is densely punctate.

Color. Ground color black. White: mandible on basal third, pronotal lobe. Yellow-brown to brown: palpi, mandible except apex and basal third, antenna, legs, tegula, wing veins, stigma.

Material Examined (3♀).—Holotype: ♀, ARGENTINA: San Isidro I-1976 B.A. (PMA). Paratypes: ARGENTINA : **Entre Ríos**: Palmar Colon I-74 Fritz (♀: 1 IIES). VENEZUELA : **Zulia**: 6km w. La concepcion, 18-VI-1976 A.S. Menke & D. Vincent (♀: 1 USNM).

Distribution (Map 16).—Argentina, Venezuela. The Venezuelan record represents the only collection locality north of the Brazilian Highlands for the genus and could represent an introduction of this species to that area.

4. *Aykhustigmus warawa* Finnamore, new species

Derivation of Name.—The species epithet, warawa, is a Quechua term meaning adorned in reference to the elaborate sculpture of this species.

Diagnosis.—The combination of the hind wing media diverging after cu-a; and frons without swellings, smoothly rounded in both sexes; and the female clypeal edge with 4 teeth, and scutum microsculptured on anterior $\frac{1}{4}$ or more will separate this species from all others in the genus.

Description.—Male. Length 3.0–4.5 mm.

Head. Flagellomeres without tyli. Clypeus and subantennal area obscured by dense appressed setae that extend up inner orbit about $1\frac{1}{4}$ length of scape. Inner orbit margined by non-foveolate carina extending $\frac{2}{3}$ up frons. Outer orbit margined from base of mandible to vertex by foveolate carina or evanescent non-foveolate ridge in smaller specimens; at mid point the carina is separated from orbit by distance subequal to basal width of man-

dible. Lower frons microsculptured; upper frons shiny, weakly microsculptured, punctate. Vertex microsculptured with puncture-like depression on mid line posterior to lateral ocelli; transverse evanescent ridge connects laterally with outer orbital carina. Lateral ocelli closer to each other than to eye. OOD $1.3\text{--}1.4 \times \text{LOD}$. Gena microsculptured, punctate near base of mandible. Occipital carina complete, foveolate, not raised.

Mesosoma. Pronotum with transverse carina raised, lateral end with small tooth; carina continued on pronotal side to anteroventral corner which is produced as tooth surpassing in size that of dorsolateral tooth. Pronotum with transverse sulcus longitudinally carinate; setae sparse, not obscuring sculpture. Pronotal side with irregular, longitudinal carinae. Scutum with microsculpture variable from densely microsculptured to microsculptured on anterior margin only; punctures present on median third (between notaular grooves which extend posteriorly as somewhat polished low ridges); lateral areas impunctate to sparsely punctate; posterior margin and often median area striatopunctate. Scutellum shiny, weakly microsculptured anteriorly, punctured; posterior microsculptured, impunctate; without foveolate sulcus on disc laterally. Mesopleuron coarsely areolate from subalar fossa to sternopleural region. Scrobal sulcus indicated by slight depression. Hypersternaulus and omaulus coarsely foveolate. Mesosternum microsculptured, sparsely punctate. Metapleuron shiny, without or with evanescent microsculpture, several short carinae on posterior margin. Hind wing media diverging after cu-a. Propodeum microsculptured, coarsely areolate, except for side next to metapleuron which is shiny, unsculptured.

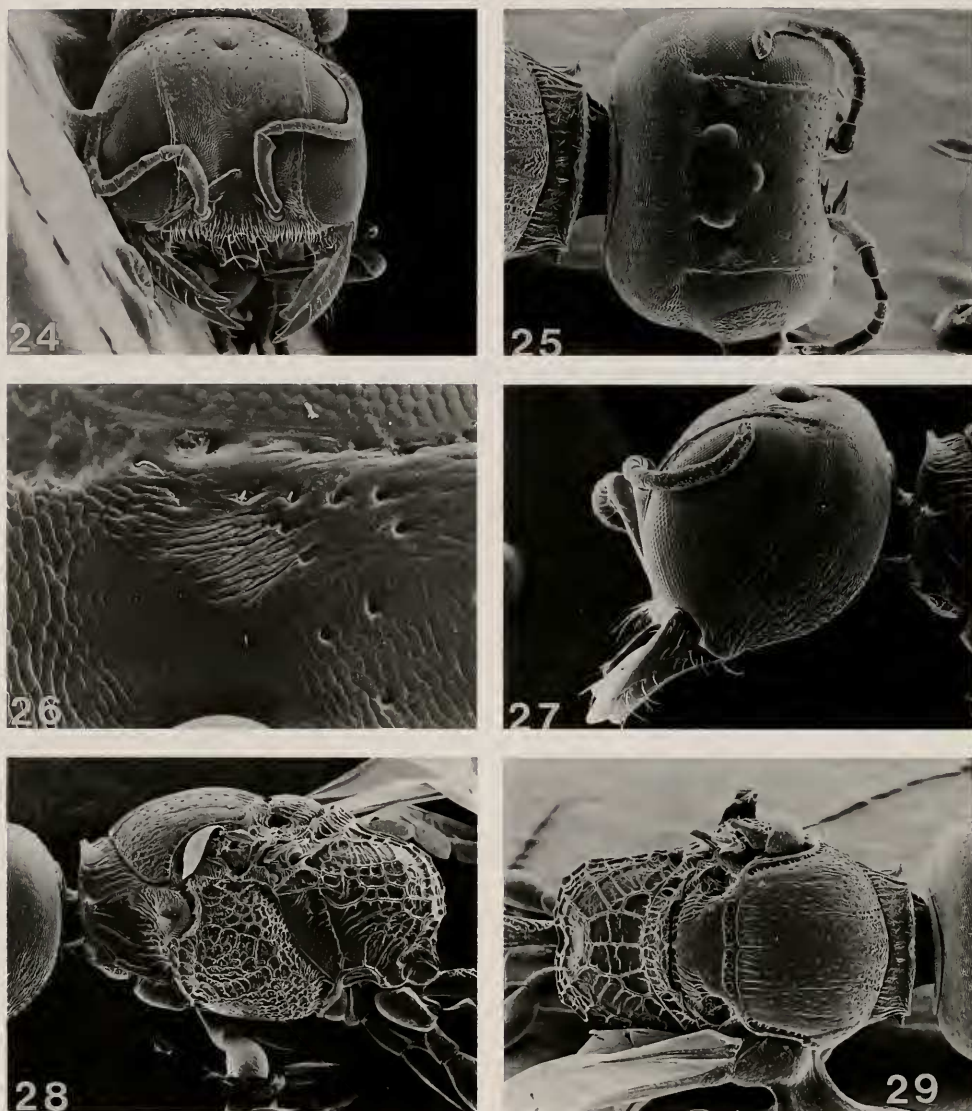
Metasoma. Terga shiny with slight oily sheen, punctures sparse and evanescent. Sterna similar to terga except punctures more dense.

Color. Ground color black. White: pronotal lobe. Yellow-brown to brown: palpi, mandibles except apically, antenna, legs, tegula, wing veins, stigma.

Female. Length 4.0–4.5 mm. Similar to male except as follows: clypeus with 4 teeth on apical margin, lateral teeth located below inner antennal socket margin and often obscured by overhanging clypeal setae. Surface of clypeus and subantennal area obscured by dense appressed setae which extend up inner orbit $3/4$ length of scape. Outer orbit unmarginated. Lower gena striatopunctate. OOD $1.4\text{--}1.6 \times \text{LOD}$. Occipital carina simple, complete, not raised or foveolate. Pygidial plate narrow, shiny, sparsely punctate. Sternum VI densely punctate.

Material Examined (13♂, 13♀).—**Holotype:** ♂, ARG. [ARGENTINA]: Salta: Rosario [de] Lerma 10–84 Fritz (IIES). **Paratypes:** **ARGENTINA: Buenos Aires:** 48–889 (♀: 1 MACN). Burzaco Sea L. 12–13-III-1974 C.R. Vardy B.M. 1974–204 (♀: 1 BMNH). Moreno, M.A. Fritz (♂: 1 IIES). Moreno 1–73, Fritz (♀: 2 IIES). La Plata (Fac. Agronomia) X-XI-68, C. Porter (♂: 1 MCZ). **Jujuy:** Palpala II-1968, M. Aczel (♀: 1 TMA). **Salta:** Pecitos 12–56, Fritz (♂: 1 IIES). Rosario [de] Lerma 10–84, Fritz (♂: 4 IIES). Urundel 26-I-950, R. Golbach (♀: 1 LILLO). Santiago del Estro: Baez 2–74, Martinez (♀: 1 IIES). **Tucuman:** Las Higueras XI-57, Ogloblin (♂: 1 IIES). San Janvier 21-X-1950, M. Aczel (♂: 1 LILLO). San Miguel, Tucuman 18-XI-1979, L.A. Stange (♂: 1 FSCA). San Pedro de Colalao, Foerster (♀: 1 IIES). Trancas, Fritz (♂: 1 IIES, ♀: 1 IIES). **BOLIVIA: Beni:** Ichilo Yapacani 2–71, Fritz (♂: 1 IIES, ♀: 1 IIES). **BRAZIL: Santa Catarina:** Nova Teutonia Feb. 1957, F. Plaumann (♀: 2 OSU). **Sao Paulo:** Campinas Mar. 1924, F.X. Williams (♂: 1 BISH). Unplaced: Minas, Jacare Dec. 1–1907 Carn. Mus. Acc. 3533 (♀: 1 CARN).

Distribution (Map 17).—Argentina, Bolivia, southern Brazil.



Figs. 24-29. *Aykhustigmus warawa* ♀. 24, head, frontal view. 25, head and prothorax, dorsal view. 26, micropore field between lateral ocellus and compound eye. 27, head, lateral view. 28, mesosoma, lateral view. 29, mesosoma, dorsal view.

INCASTIGMUS Finnamore, new genus
(Figs. 30-35)

Derivation of Name.—*Incastigmus* is named after the indigenous Inca people of South America.

Diagnosis.—The presence of a median groove or posteromedian pit on the scutum will separate this genus from all others in the Stigmina.

Description.—Head. Labrum quadri-lobed with narrow, deep median emargination. Mandible with apex in both sexes tridentate; apicoventral tooth in female acute; inner basal tooth absent. Clypeal apex in male without bevelled modifications; with 4 teeth in female. Interantennal tubercle absent. Frontal line absent. Micropore field present. Inner orbits converging

below. Eye at most partially margined by a carina. Occipital carina complete, not joining hypostomal carina, simple in female; raised, foveolate in male.

Mesosoma. Scutum with a median groove or at least a posteromedian pit; notaular groove usually elongate. Acetabular carina intercepting omaulus. Scrobal sulcus present. Hypoepimeral area without coarse sculpture. Mid basitarsus of male elongate, as long as next 3 tarsomeres combined. Posterior margin of hind tibia with 2 or 3 spines. Fore wing without setae in cellular area. Hind wing media diverging before cu-a; submedian cell of normal size, not reduced.

Metasoma. Petiole carinate. Pygidial plate narrow, absent in male. Digitus elongate relative to cuspis, clubbed.

Type Species.—*Incastigmus inti* new species.

Distribution.—Neotropical.

Species Transferred.—*Stigmus hexagonalis* Fox, *S. neotropicus* Kohl, *S. smithii* Ashmead, and *S. thoracicus* Ashmead. The 25 species of *Incastigmus* are the subject of the forthcoming Part 2 of this revision.

Incastigmus inti Finnamore, new species

Derivation of Name.—Inti is a Quechua term meaning sun in reference to the central position of this species as type for the genus.

Diagnosis.—The combination of the following characters will separate this species from all others in the genus. Micropore field on vertex oval. Scutum with median and notaular grooves complete from anterior to posterior margin, without regular longitudinal carinae between grooves. Pronotal lobe white, rounded conical, not flattened or toothed or dark. Male antenna with tylus on apical flagellomere. Female clypeus with 2 elongate setae issuing from 2 narrowly separated pits on median lobe. Female frons shiny, without microsculpture anterolaterally to mid ocellus.

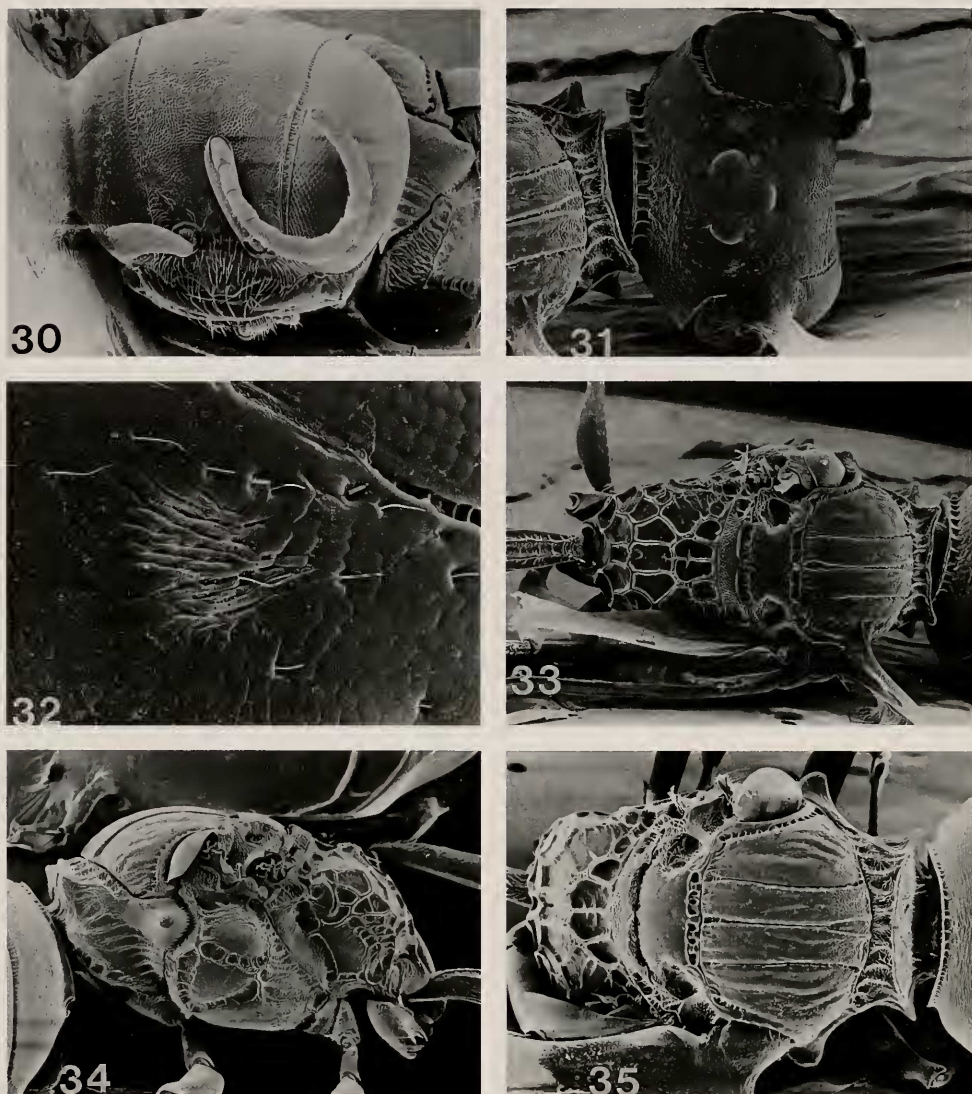
Description.—Male. Length 2.5–4.0 mm.

Head. Flagellomeres without specialized setae; II–XI with tyli, that on flagellomere XI imparting asymmetrical shape; basal flagellomere length $2.2 \times$ apical width; penultimate flagellomere length $1.4 \times$ apical width. Head microsculptured on lower frons, mid frons and vertex but shiny on upper lateral frons, punctures sparse. Clypeus obscured by dense appressed setae which extend up inner orbits little more than height of antennal socket. Micropore field present as discrete patch. Ocelli closer to each other than to compound eyes. OOD $1.7 \times$ LOD. Gena microsculptured, sparsely punctate, non-carinate, without ventral tooth or swelling. Occipital carina foveolate.

Mesosoma. Transverse carina of pronotum toothed laterally, continued ventrally to pronotal side and terminating in a ventrolateral tooth; transverse sulcus longitudinally carinate. Pronotal side carinate, lobe conical with rounded apex. Scutum entirely microsculptured to weakly microsculptured with shiny patches; notaular groove complete to posterior margin; median groove complete to anterior margin; punctures sparse. Scutellum microsculptured. Mesopleuron variable from entirely microsculptured to weakly shiny with reduced microsculpture, sparsely punctate to impunctate. Preomalar area with sparse setae that do not obscure underlying sculpture. Hypersternaulus, omaulus and scrobal sulcus foveolate. Metapleuron usually microsculptured. Propodeum shiny, generally without microsculpture, uniformly coarsely areolate except anterolaterally without sculpture.

Metasoma. Terga shiny, microsculpture and punctures evanescent (appearing impunctate). Sterna weakly microsculptured, punctures sparse.

Color. Ground color black. White: mandible medially, pronotal lobe. Yellow-brown: palpi, mandible subapically, antenna, fore leg except coxa, mid leg except coxae, hind trochanter and tarsus, tegula, metasomal sternum VIII.



Figs. 30–35. *Incastignus inti*. 30, ♀ head, frontal view. 31, ♂ head and prothorax, dorsal view. 32, ♂ micropore field between lateral ocellus and compound eye. 33, ♂ mesosoma, dorsal view. 34, ♀ mesosoma, lateral view. 35, ♀ mesosoma, dorsal view.

Female. Length 3.0–4.25 mm. Similar to male except as follows: antenna without tyli, penultimate flagellomere length $1.25 \times$ apical width. Clypeus shiny, usually sparsely punctate, occasionally moderately dense punctation grouped in median area; median lobe with 2 elongate setae issuing from 2 narrowly separated pits; apex with truncate median lobe. Scutum with several irregular carinae between no-

taular and median grooves. Color as above but variable to dark antennal flagellum and dark femora.

Material Examined (258♂ 109♀).—Holotype: ♂, ECUADOR: Napo Prov. Tena, sweep 15-II-1986 A.T. Finnamore (PMA). Paratypes: **BOLIVIA: La Paz:** Chulumani 1,700m 25-III-1979 M. Cooper B.M. 1979–216 (♀: 2 BMNH). Chulumani 1,700m 30-III-1979 M. Cooper B.M. 1979–216 (♀: 1

BMNH). Chulumani 1,700m 31-III-1979 M. Cooper B.M. 1979-216 (♂: 1 BMNH). Chulumani 1,700m 3-IV-1979 M. Cooper B.M. 1979-216 (♂: 1 BMNH. ♀: 2 BMNH). Coroico-Chulomani III-7-1968 Garcia & Porter (♀: 1 MCZ). Coroico, Sta. Barbara 1100m 4-I-1975 (♀: 1 PMA). Tumupasa Dec. W.M. Mann, Mulford Biol. Expd. 1921-1922 (♂: 1 USNM). Yungas, 13km s. Caranavi 850m 27-III-1973 J. Helava (♀: 2 PMA). Unplaced: Las Juntas Dec. 1913, Steinbach (♀: 1 CARN). **BRAZIL: Mato Grosso:** Itaum III-1974 M. Alvarenga (♀: 3 AEI). **Para:** Belem IPEAN XII-1-4-1969 J.M. & B.A. Campbell (♀: 1 BRD). **COLOMBIA: Caqueta:** Florencia 480m 31-X-1971 M. Cooper B.M. 1972-275 (♀: 1 BMNH). Yuruyaco, 73k sw. Florencia 3-II-1979 M. Cooper B.M. 1979-106 (♀: 1 BMNH). Yuruyaco, 73k sw. Florencia 12-II-1979 M. Cooper B.M. 1979-106 (♂: 1 BMNH). Yuruyaco, 73k sw. Florencia 13-II-1979 M. Cooper B.M. 1979-106 (♂: 1 BMNH). **Putumayo:** Mocoa 13-IV-1974 M. Cooper B.M. 1974-327 (♂: 1 BMNH). Mocoa 16-IV-1974 M. Cooper B.M. 1974-327 (♀: 5 BMNH). Mocoa 18-IV-1974 M. Cooper B.M. 1974-327 (♂: 1 BMNH). Mocoa 19-IV-1974 M. Cooper B.M. 1974-327 (♂: 1 BMNH). Mocoa 14-VI-1974 M. Cooper B.M. 1974-548 (♂: 1 BMNH). Mocoa 24-VI-1974 M. Cooper B.M. 1974-548 (♂: 2 BMNH). Mocoa 26-VI-1974 M. Cooper B.M. 1974-548 (♀: 2 BMNH). Mocoa 16-VII-1978 M. Cooper B.M. 1978-431 (♀: 1 BMNH). Mocoa 7-IX-1974 M. Cooper B.M. 1975-33 (♂: 1 BMNH). Mocoa 27-IX-1974 M. Cooper B.M. 1975-33 (♂: 1 BMNH). Mocoa 600m 26-III-1976 M. Cooper B.M. 1976-290 (♂: 1 BMNH). Mocoa 18-III-1978 M. Cooper B.M. 1978-431 (♂: 1 BMNH). Villa Garzon, 8 mi s. Mocoa 3-VIII-1978 M. Cooper B.M. 1978-431 (♂: 1 BMNH). **Vaupés:** Mitu 11-V-1974 M. Cooper B.M. 1974-327 (♂: 1 BMNH). **ECUADOR: Carachi:** Chical 1250m 0-56N 78-11W, 1-VIII-1983 J. Rawlings, M. Smyers (♀: 1 CARN). **Napo:** Coca, May 1965 Luis Peña (♂: 1 AEI). Coca & Napo Rivers, V-1-12-65,

Luis Peña (♂: 1 AEI). Limoncocha 250m, 15-28-VI-1976 S. & J. Peck (♂: 2 BRD, ♀: 2 BRD). Misahualli, down Río Napo 19-II-1983 L. Huggert (♂: 15 PMA, ♀: 2 PMA). Muyuna, 5km w. Tena 29-IX-1978 M. Cooper B.M. 1979-20 (♀: 1 BMNH). Puerto Misahualli 350m II-1983 Sharkey (♂: 2 PMA, ♀: 3 PMA). Puerto Misahualli, 30km e. 350m II-1983 Sharkey (♂: 9 PMA). Santa Cecilia III-25-31-1969 P. & P. Spangler (♂: 1 USNM). Tena 9-14-II-1971 M. Cooper B.M. 1972-275 (♂: 1 BMNH). Tena 8-VII-1976 S. & J. Peck (♀: 3 PMA). Tena 400m II-1983 M. Sharkey (♂: 6 PMA, ♀: 1 PMA). Tena, sweep 15-II-1986 A.T. Finnermore (♂: 12 PMA, ♀: 3 PMA). Tena, sweep 18-II-1986 A.T. Finnermore (♀: 1 PMA). Tena, 12km sw. 500m 8-11-VII-1976 S. & J. Peck (♀: 1 BRD). Tena-Puyo Hwy. 5km n. Santa Clara 21-II-1986 sweep, T. Thormin & J. Wojcicki (♂: 1 PMA). **Pastaza:** Puyo 960m 1-8-X-1970 J. & M. Sedlacek (♂: 8 BISH). Puyo 900-960m 1-8-X-1970 J. & M. Sedlacek (♂: 7 BISH). Puyo 22km sw. 900m 14-16-VII-1976 S. & J. Peck, forest (♂: 1 BRD, ♀: 2 BRD). Puyo 23km se 19-V-1977 P.J. Spangler & D.R. Givens #58 (♀: 1 USNM). Puyo 44km s. 21 May 1977 DL & SS Vincent (♂: 5 USNM, ♀: 2 USNM). Puyo 18km n. 1100m 14-8-1982 R. Hensen & A. Aptroot (♂: 1 RNH). **Pichincha:** Tinalandia 800m III-1983 L. Masner & M. Sharkey (♂: 2 PMA). **Zamora:** Río Jumbeo 1-IV-1965 Peña (♂: 5 MCZ, ♀: 2 MCZ). Zamora IV-4-1965 Peña (♂: 1 AEI). Unplaced: Cumbaratza (E) XI-21-1970 Luis E. Peña (♂: 1 AEI). Mera 26-I-1923 F.X. Williams (♂: 1 BISH). **PARAGUAY: Guaira:** w. Villarica, Caballero, I-72 Peña (♂: 1 IIES). Unplaced: Piareta 12-71 Peña (♂: 1 IIES). **PERU: Cuzco:** Agua Calliente 21-28-XII-1983 L. Huggert (♂: 8 PMA, ♀: 1 PMA). Machu Picchu 1-XII-1965 H. & M. Townes (♀: 1 AEI). Qunicemil, 750m nr. Marcapata September 1962 Luis Peña (♂: 8 AEI, ♀: 3 AEI). **Huanuco:** Cayumba, 35km s. Tingo Maria 800m 1-XI-1973 J.M. Schunke B.M. 1974-37 (♀: 1 BMNH). Las

Palmas 5km sw. 1000m X-16-1954 E.I. Schlinger & E.S. Ross (♂: 2 CAS). Las Palmas 10mi sw. 1000m IX-26-1954 E.I. Schlinger & E.S. Ross (♀: 4 CAS). Monson Valley, Tingo Maria IX-21-1954 E.I. Schlinger & E.S. Ross (♂: 1 CAS). Monson Valley, Tingo Maria 23-IX-1954 E.I. Schlinger & E.S. Ross (♂: 6 CAS, ♀: 3 CAS). Monson Valley, Tingo Maria X-10-1954 E.I. Schlinger & E.S. Ross (♂: 4 CAS, ♀: 3 CAS). Monson Valley, Tingo Maria X-19-1954 E.I. Schlinger & E.S. Ross (♀: 1 CAS). Monson Valley, Tingo Maria X-21-1954 E.I. Schlinger & E.S. Ross (♂: 1 CAS, ♀: 1 CAS). Monson Valley, Tingo Maria X-26-1954 E.I. Schlinger & E.S. Ross (♀: 1 CAS). Monson Valley, Tingo Maria XI-21-1954 E.I. Schlinger & E.S. Ross (♂: 1 CAS). Monson Valley, Tingo Maria XI-29-1954 E.I. Schlinger & E.S. Ross (♂: 1 CAS, ♀: 1 CAS). Monson Valley, Tingo Maria XII-2-1954 E.I. Schlinger & E.S. Ross (♀: 1 CAS). Tingo Maria 26-29-I-1984 L. Huggert (♂: 14 PMA, ♀: 3 PMA). Tingo Maria 30-I-1984 L. Huggert (♂: 6 PMA, ♀: 1 PMA). Tingo Maria, 1km e. 15-VIII-1971 P.S. & H.L. Broomfield. MT dense woodland B.M. 1971-486 (♀: 1 BMNH). Tingo Maria, 26 mi. e. XII-10-54 1100m E.I. Schlinger & E.S. Ross (♀: 1 CAS). Tingo Maria, 67 mi. e. X-4-54 350m E.I. Schlinger & E.S. Ross (♀: 1 CAS). Tocache 2-II-1984 L. Huggert (♂: 4 PMA, ♀: 1 PMA). **Junin:** Colonia Perene, Río Perene 18 mi ne La Merced I-3-55 E.I. Schlinger & E.S. Ross (♂: 2 CAS, ♀: 1 CAS). Paratuchali 22-I-1984 L. Huggert (♂: 10 PMA, ♀: 4 PMA). Satipo 18-I-1984 L. Huggert (♂: 10 PMA, ♀: 1 PMA). Satipo 19-24-I-1984 L. Huggert (♂: 11 PMA, ♀: 6 PMA). **Lima:** Magdalena [del Mar?] [Lima?] Mar 28-10 CHT Townsend (♀: 1 USNM). **Loreto:** Iquitos, ne. Río Nanay 6-II-1984 L. Huggert (♂: 10 PMA). Iquitos, Gransa UNAP 9-II-1984 L. Huggert (♂: 2 PMA). Iquitos, Quisto Cocha 5-II-1984 L. Huggert (♂: 1 PMA). Iquitos, Barilla 10-II-1984 L. Huggert (♂: 1 PMA). **Madre de Dios:** Laberinto, 70km w. Pto. Maldonado on Río Madre de Dios 1-2-I-

1984 A.T. Finnamore (♀: 1 PMA). Pto. Maldonado 1-11-I-1984 L. Huggert (♂: 50 PMA, ♀: 14 PMA). Tambopata Reserve, 50km s. Pto. Maldonado on Río Tambopata 3-8-I-1984 A.T. Finnamore (♂: 1 PMA, ♀: 1 PMA). **Ucayali:** Tacshitea, 88km n. Pucallpa jct. Río Callaria & Río Ucayali 22-25-I-1984 A.T. Finnamore (♂: 1 PMA). **VENEZUELA:** **Zulia:** El Tucuco, 45km sw. Machiques, 5-6-VI-1976 A.S. Menke & D. Vincent (♀: 1 USNM).

Distribution (Map 18).—Bolivia, Brazil, Ecuador, Paraguay, Peru, Venezuela.

***Incastigmus thoracicus* (Ashmead),
new combination**

Stigmus thoracicus Ashmead 1900:223 ♀. Holotype*: ♀, St. Vincent W.I., H. Smith 238/W. Indies 99-331 (BMNH type Hym 21.885).

Stigmus smithii Ashmead 1900:223 ♀. **New synonymy.** Holotype*: ♂, W. Indies (BMNH type Hym 21.886). 99-331. Ashmead incorrectly sexed the type specimen when he described *smithii* based on a single female. The holotype is a male.

Diagnosis.—The red petiole is sufficient to distinguish this species in lighter colored specimens. Darker (and lighter) specimens are distinguished by the extreme reduction of the median scutal groove, shiny hypoepimeral area, and rounded corners of the transverse pronotal carina.

Description.—Male. Length 3.0-3.8 mm.

Head. Flagellomeres without tyli or specialized setae; basal flagellomere length $2.0 \times$ apical width; penultimate flagellomere length $1.1 \times$ apical width. Head almost uniformly microsculptured; upper frons and vertex with slightly less microsculpture and with sparse obscure punctures. Clypeus obscured by dense appressed setae which extend broadly up inner orbits to height of scape. Micropore field present as discrete patch. Ocelli closer to each other than to eyes. OOD $2.0 \times$ LOD. Gena microsculptured, sparsely punctate, non-carinate, without ventral swelling or tooth. Occipital carina foveolate.

Mesosoma. Pronotum with transverse carina rounded laterally, not toothed or produced; transverse sulcus with evanescent longitudinal carinae; pronotal lobe normal, not toothed; side with several evanescent carinae. Scutum shiny, weakly microsculptured; notaular groove present anteriorly, not elongate; median groove absent, pit evident posteriorly as one of many evanescent fovea in transverse row next to posterior margin; punctures minute, sparse. Scutellum and mesopleuron shiny, without microsculpture; impunctate except sternopleural region with minute sparse punctures; preomalar area with sparse setae; hypersternaulus without foveae; scrobal sulcus and omaulus weakly foveolate. Metapleuron microsculptured on ventral half, otherwise shiny, impunctate. Propodeum shiny, without microsculpture over most of basolateral area and dorsolateral spheres; basolateral area adjacent to metapleuron without sculpture; dorsal enclosure areolae evanescent, areolae small relative to larger evanescent areolae of dorsolateral spheres, the 2 groups of areolae separated by a smooth unsculptured area.

Metasoma. Terga shiny, without microsculpture; punctures sparse, evanescent. Sterna weakly microsculptured, punctures sparse but increasing in density on posterior metasoma.

Color. Light form: ground color black. White: palpi, mandible except apex, spot on pronotal lobe, fore tibia and tarsus, mid tibia and tarsus, hind tibia on basal half or more and tarsus. Yellow-orange: antenna, mesosoma except propodeal dorsum, fore leg basal to tibia, mid leg basal to tibia, hind leg basal to tibia and apex of tibia, petiole except ventral apex, apex of 1 or more sterna. Dark form: ground color black. White: palpi, mandible except apex, spot on pronotal lobe, basal ring of hind tibia. Yellow-brown: antenna, pronotum except dorsally and spot on pronotal lobe, mesopleuron anteriorly, fore leg, mid leg, hind trochanter and tarsus, tegula.

Female. Length 3.9 mm. Similar to male except as follows: basal flagellomere length $3.0 \times$ apical width. Clypeus shiny, with several punctures, setae sparse; clypeal apex with median teeth separated by shallow emargination; median lobe with 2 elongate setae issuing from 2 narrowly separated pits. Inner orbits sparsely setose, not obscuring sculpture. OOD $2.5 \times$ LOD. Color, as above for light form except white on scape and orange on clypeus and propodeal dorsum.

Material Examined (6♂, 5♀).—**DOMINICA:** Pont Casse; Springfield; Springfield Plantation. **GRENADA:** 2500 feet. Balthazar, windward side; Botanical Garden. **ST. VINCENT:** (no other data).

Distribution (Map 19).—Dominica, Grenada, St. Vincent.

LLAQHASTIGMUS Finnamore, new genus (Figs. 36–38)

Derivation of Generic Name.—Llaqha is a Quechua term meaning dark, in reference to the generally black coloration of species in this genus.

Diagnosis.—Females of this genus can be separated from all others in the Stigmina by the enlarged, truncate, apicoventral mandibular tooth. Females in other genera have an acute apicoventral tooth. Males can be separated with a combination of a tridentate mandible and a scutum without a trace of a posteromedian pit or groove. Males in other genera have a bidentate mandible or at least a posteromedian pit on the scutum.

Description.—Head. Labrum bilobed with a small median notch (labrum quadrilobed in 2 species both of which lack a subomaulus). Mandible with apex tridentate; apicoventral tooth in female enlarged, apex truncate; without inner basal tooth. Clypeal apex unmodified in male, without bevelled edge; in female with 4 teeth. Interantennal tubercle absent. Frontal carina absent. Vertex with micropore field between lateral ocellus and com-

pound eye. Inner orbits converging below. Eye not margined by carina. Occipital carina complete, not joining hypostomal carina, simple in female, foveolate in male, otherwise unmodified.

Mesosoma. Scutum without trace of median groove or posteromedian pit; notaular groove normal, not elongate. Acetabular carina intercepting omaulus. Scrobal sulcus often evanescent. Hypoepimeral area without coarse sculpture. Mid basitarsus of male elongate, as long or longer than next 3 tarsomeres combined. Poste-

rior margin of hind tibia with 2 or 3 spines. Fore wing without setae in cellular area. Hind wing media diverging before cu-a; submedian cell of normal size, not reduced.

Metasoma. Petiole carinate. Pygidial plate narrow, absent in male. Digitus elongate.

Type Species.—*Llaqhastigmus jatunkirus* Finnamore, new species.

Distribution (Map 37).—Neotropical, restricted to South America (subtropical highland or montane forest?).

KEY TO SPECIES OF *LLAQHASTIGMUS*

- 1 Male 2
- 1' Female 15
- 2 Gena ventrolaterally and sternopleural region with relatively dense, elongate setae; Peru 13. *shachus* Finnamore, new species
- 2' Gena and sternopleural region sparsely pubescent with short inconspicuous setae 3
- 3 Preomaular area densely setose, obscuring sculpture; mesosoma often extensively red; se. Brazil 8. *mantanti* Finnamore, new species
- 3' Preomaular area sparsely setose; mesosoma black except pronotal lobe which is usually white 4
- 4 Scape, fore femur, and pronotal lobe, black; mesosoma with scrobal sulcus foveolate; clypeus sparsely setose, underlying punctures visible; Ecuador, Colombia 3. *chutiayana* Finnamore, new species
- 4' One or more of scape, fore femur, or pronotal lobe, yellow-brown or white; mesosoma with scrobal sulcus usually smooth, rarely foveolate; clypeus usually obscured by dense appressed setae 5
- 5 Subomaulus absent 6
- 5' Subomaulus present 7
- 6 Petiole with 3 or 4 coarse lateral carinae; Bolivia 2. *australis* Finnamore, new species
- 6' Petiole microcarinate laterally; Ecuador, Colombia 11. *santanderanus* Finnamore, new species
- 7 Scape brown with yellow-brown at base and apex only; flagellum and femora black; propodeum with area adjacent to enclosure finely carinate, lateral spheres without large areolae; transscutellar sulcus with foveae small or absent; scrobal sulcus not foveolate, only slightly impressed; Ecuador 5. *ecuatorialis* Finnamore, new species
- 7' Scape yellow-brown at least ventrally; one or more femora usually yellow to yellow-brown; propodeum with area adjacent to enclosure irregularly sculptured, lateral spheres coarsely areolate; transscutellar sulcus usually with prominent foveae; scrobal sulcus often foveolate 8
- 8 Head and mesosoma coarsely, uniformly microsculptured, dull; microsculpture of frons not distinct from that of vertex; scutum with small evanescent punctures; Peru, Ecuador, Venezuela 9. *muthus* Finnamore, new species
- 8' Vertex, anterior to mid ocellus, more shiny than frons (less microsculpture) and/or mesosoma with mid and lower mesopleuron shiny, without or with little microsculpture; punctuation of scutum distinct or absent 9
- 9 Scutum shiny, without microsculpture on posterior $\frac{2}{3}$; scutellum punctures sparse, min-

- ute, appearing impunctate; scrobal sulcus coarsely foveolate; Ecuador, Colombia, Venezuela 14. *sharkeyi* Finnamore, new species
- 9' Posterior half of scutum microsculptured and/or punctate or scrobal sulcus smooth, without foveae 10
- 10 Pronotal lobe brown to black; posterior half of scutum shiny, punctures sparse; scrobal sulcus only slightly evident, not foveolate; Ecuador, Colombia 10. *nigricollaris* Finnamore, new species
- 10' Pronotal lobe white; posterior half of scutum punctate and/or microsculptured; scrobal sulcus usually foveolate 11
- 11 Transverse sulcus of pronotum without longitudinal carinae, sulcus smooth, usually without sculpture 12
- 11' Transverse sulcus of pronotum with longitudinal carinae 13
- 12 Propodeum with few carinae on lateral sphere, shiny toward metapleuron; petiole (measured dorsally) longer than first tergum; Peru 7. *Ilutanis* Finnamore, new species
- 12' Propodeum with dense irregular carinae on lateral sphere and with microsculpture adjacent to metapleuron; petiole (measured dorsally) shorter than first tergum; Bolivia, Peru 12. *sapanis* Finnamore, new species
- 13 Occipital carina simple, not foveolate or raised ventrally; tarsi white; Ecuador 1. *ambiguus* Finnamore, new species
- 13' Occipital carina at least finely foveolate and usually slightly raised ventrally; tarsi white to yellow brown 14
- 14 Scrobal sulcus coarsely foveolate; scutum coarsely but sparsely punctured in single known specimen; Colombia 4. *colombianus* Finnamore, new species
- 14' Scrobal sulcus finely, if at all, foveolate; scutum finely to coarsely punctured; Venezuela to Bolivia 6. *jatunkirus* Finnamore, new species
- 15 Gena ventrally and sternopleural region with relatively dense, elongate setae; Peru 13. *shachus* Finnamore, new species
- 15' Gena ventrally and sternopleural region sparsely pubescent with short inconspicuous setae 16
- 16 Fore coxa and usually some of prothorax red; se. Brazil 8. *mantanti* Finnamore, new species
- 16' Prothorax and fore coxa black 17
- 17 Microsculpture of head and scutum uniform throughout; scutum with small obscure punctures; Peru, Ecuador, Venezuela 9. *muthus* Finnamore, new species
- 17' Microsculpture of vertex not as dense as frons (vertex more shiny); scutum often shiny or with large punctures 18
- 18 Pronotal lobe dark, brown to black 19
- 18' Pronotal lobe white 20
- 19 Scrobal sulcus coarsely foveolate; dorsal mandibular tooth acute; scape black; Ecuador, Colombia 3. *chutiyana* Finnamore, new species
- 19' Scrobal sulcus finely foveolate; dorsal mandibular tooth broad; scape yellow; Ecuador, Colombia 10. *nigricollaris* Finnamore, new species
- 20 Propodeum closely and finely carinate on area adjacent to enclosure; Ecuador 5. *ecuatorialis* Finnamore, new species
- 20' Propodeum coarsely areolate on area adjacent to enclosure 21
- 21 Transverse sulcus of pronotum without longitudinal carinae, smooth, usually without sculpture 22
- 21' Transverse sulcus of pronotum with at least a few longitudinal carinae 23
- 22 Clypeus with elongate specialized setae on apical edge except for narrow median emargination; Peru 7. *Ilutanis* Finnamore, new species
- 22' Clypeus with elongate specialized setae on median and lateral teeth only; Peru, Bolivia 12. *sapanis* Finnamore, new species
- 23 Scutum shiny, without microsculpture on posterior $\frac{2}{3}$; punctures minute, sparse, appear-

- ing impunctate posteriorly; scrobal sulcus foveolate; Ecuador, Venezuela 14. *sharkeyi* Finnamore, new species
- 23' Scutum with microsculpture **and/or** punctures posteriorly; scrobal sulcus foveolate or not 24
- 24 Scrobal sulcus entirely foveolate; clypeal punctures minute, relatively dense and more or less equally distributed on raised area above median teeth; Colombia 4. *colombianus* Finnamore, new species
- 24' Scrobal sulcus usually foveolate anteriorly or not at all, occasionally entirely foveolate; clypeal punctures sparse with relatively large more or less impunctate area above median teeth 25
- 25 Clypeal teeth black; Venezuela to Bolivia 6. *jatunkirus* Finnamore, new species
- 25' Clypeal teeth yellow-brown; Ecuador 1. *ambiguus* Finnamore, new species

1. ***Llaqhastigmus ambiguus*** Finnamore,
new species

Derivation of Name.—The species epithet, *ambiguus*, is from the Latin “ambiguus” meaning of doubtful nature, in reference to the single known locality and lack of material to adequately judge variation.

Diagnosis.—The simple occipital carina that is not raised ventrally or foveolate will distinguish males of this species from all others and females from most other species in the genus. Males of all other species and females of most species have an occipital carina at least slightly raised ventrally bearing at least several foveae. Additionally, female *ambiguus* are without red coloration, have yellow-brown clypeal teeth, normal genal setae, differing microsculpture density between frons and vertex, and scutum with microsculpture and sparse punctures. Females likely to be confused with this species have one or more of the following: clypeal teeth black, mesosoma red in part, setae of lower gena elongate and relatively dense, frons and vertex with uniform microsculpture density, and/or scutum shiny apparently without punctures.

Description.—Male. Length 3.4–4.6 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex adjacent to mid

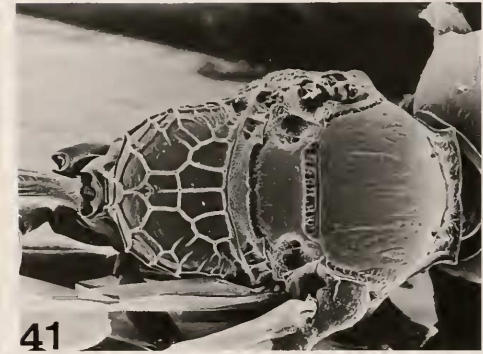
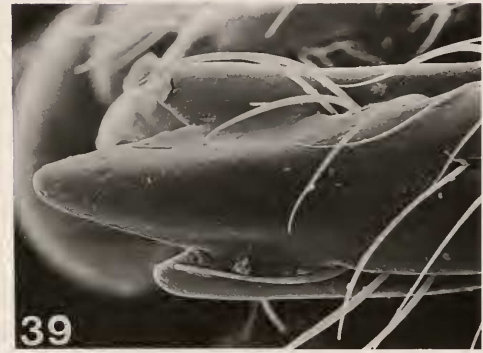
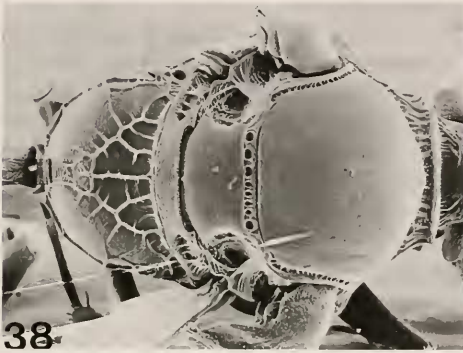
ocellus. Occipital carina simple, not raised ventrally or foveolate.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum microsculptured, with fine sparse punctures more than 5 diameters apart (sometimes interspersed with more coarse, although equally sparse punctures) and concentrated on centre of disc. Transscutellar sulcus foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomalar present. Scrobal sulcus usually with irregular foveae on at least anterior third; foveae variable from almost absent to present on entire scrobal sulcus. Sternopleural region microsculptured with sparse (apparently absent) setae. Propodeum shiny, area adjacent to enclosure and lateral sphere with several large areolae composed of relatively low carinae.

Metasoma. Petiole with 3 or 4 coarse carinae laterally.

Color. Ground color black. White: mandible except apically, palpi, pronotal lobe, tarsi. Yellow to yellow-brown: antenna (generally yellow ventrally to brown dorsally on apical flagellomeres), tegula, fore and mid legs except tarsi, wing veins, apical metasomal sterna. Brown: mandibular apex, stigma of fore wing, hind leg except tarsus.

Female. Length 3.9 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate, much larger



Figs. 36–41. *Llaqhastignus* and *Stigmus*. 36, *Llaqhastignus jatunkirus* ♀, head, frontal view. 37, *L. jatunkirus* ♀, mandible, outer view. 38, *L. jatunkirus* ♀, mesosoma, dorsal view. 39, *Stigmus* sp. ♀, mandible, outer view. 40, *Stigmus* sp. ♀, head, frontal view. 41, *Stigmus* sp. ♀, mesosoma, dorsal view.

than other teeth. Clypeal apex quadridentate as follows: a lateral lobe flanking lateral edge of labrum, a pair of smaller median teeth separated from lateral lobes by broad emarginations and separated from each other by a narrow U-shaped emargination. Clypeal apex with specialized flattened, elongate, setae on teeth but absent from emarginate interspaces; 2 setae

per median tooth and 6–7 on lateral lobe. Clypeus shiny, microsculpture absent, punctures 3–4 diameters apart on disc. Apical margin of clypeus yellow-brown.

Material Examined (27♂, 1♀).—Holotype: ♀, ECUADOR: Pich. Prov. Guayllabamba, 10km n. on Río Pisque, 2500m II-1983. M. Sharkey, L. Masner (BRD). Paratypes: ECUADOR: Pichincha: Guay-

llabamba, 10km n. on Río Pisque, 2500m II-1983. L. Masner, M. Sharkey (δ : 2 BRD, 2 PMA). 10km n. Guayllabamba 26-II-1983. Masner & Sharkey (δ : 4 BRD, 19 PMA).

Distribution.—(Map 20). Ecuador.

2. *Llaqhastigmus australis* Finnamore, new species

Derivation of Name.—The species epithet is derived from the Latin "austral" meaning southern in reference to the southern locality of the only known specimen.

Diagnosis.—Female unknown. Male: labrum quadrilobed with a deep median notch; subomaulus absent, petiole coarsely carinate (carinae normal) laterally. *L. australis* and *santanderanus* are the only species in the genus lacking a subomaulus and having a quadrilobed labrum (at least in males, females for both species are unknown). In all other species in the genus the subomaulus is present and the labrum is bilobed with a slight median emargination.

Description.—Male. Length 5.0 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Labrum quadrilobed with a deep median emargination. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex. Occipital carina raised ventrally and finely foveolate at least ventrally.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum microsculptured, punctures sparse more or less evenly distributed and separated by 5–10 puncture diameters. Transscutellar sulcus not foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomaulus absent, represented as an evanescent ridge near posteroventral apex of pronotum, not carinate or intersecting omaulus. Scrobal sulcus weakly impressed anteriorly, attenuated posteriorly, not foveolate. Sternopleural region shiny without microsculp-

ture, sparsely punctate, sparsely setose. Propodeum shiny, area adjacent to enclosure without microsculpture, with several large areolae composed of low carinae; lateral sphere shiny, with evanescent microsculpture, areolae smaller.

Metasoma. Petiole with 3 coarse lateral carinae.

Color. Ground color black. White: mandible except apically, palpi, pronotal lobe. Yellow-brown: scape, pedicel, fore and mid legs except coxae, hind tibia and tarsus, tegula, apical metasomal sterna.

Female. Unknown.

Material Examined (1 δ).—Holotype: δ , BOLIVIA: Cochabamba, Prov. Carrasco, Empalme 3000m II-1971. Fritz y Martinez (IIES).

Distribution (Map 21).—Bolivia.

3. *Llaqhastigmus chutiyana* Finnamore, new species

Derivation of Name.—The species epithet is derived from the Quechua terms "ch'uti", meaning naked and "yana", meaning black, in reference to the relatively hairless condition of this black species.

Diagnosis.—The combination of the black scape and pronotal lobe, scrobal sulcus foveolate, and the apicodorsal mandibular tooth of female acute (normal) will separate this species from all others in the genus. All other species except *nigricollaris* have a white pronotal lobe. *L. chutiyana* is distinguished from *nigricollaris* by the black scape, foveolate scrobal sulcus and acute apicodorsal mandibular tooth in the female; *nigricollaris* has a yellow-brown scape, partially foveolate scrobal sulcus and enlarged apicodorsal mandibular tooth in the female.

Description.—Male. Length 3.9–5.0 mm.

Head. Sculpture of clypeus not obscured by setae. Clypeus shiny without microsculpture, setae and punctures sparse and at least 1 diameter apart on disc. Gena ventrally with evanescent microsculpture, punctures and setae sparse,

setae less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex. Occipital carina raised ventrally and foveolate on at least that area.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum microsculptured, punctures small and sparse, punctures more or less evenly distributed although somewhat less dense on posterior disc. Transscutellar sulcus foveolate. Preomalar area asetose. Subomalar present. Scrobal sulcus coarsely foveolate. Sternopleural region shiny often with evanescent microsculpture, punctures sparse and minute. Propodeum shiny without microsculpture, area adjacent to enclosure and lateral sphere with large areolae composed of relatively high carinae.

Metasoma. Petiole with 2 or 3 lateral carinae.

Color. Ground color black. Yellow-brown to brown: mandibles except apically, palpi, fore and mid tibiae and tarsi, hind tibia on inner side and tarsus, tegula, apical metasomal sterna.

Female. Length 4.1–4.4 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate and much larger than other teeth. Clypeal apex quadridentate as follows: lateral lobe flanking edge of labrum, pair of smaller median teeth separated from lateral lobe by deep emargination and from each other by U-shaped notch. Clypeal apex with 4 specialized, flattened, elongate setae on lateral lobe and 2 per median tooth, setae absent from emarginate interspaces. Clypeus shiny, microsculpture absent; punctures sparse, 3 or more diameters apart. Apical margin of clypeus black.

Material Examined (8♂, 3♀).—Holotype: ♂, ECUADOR: Tungurahua, Banos 2,000m. 21-X-1974. M. Cooper B.M.1975–33 (BMNH). Paratypes: **COLOMBIA: Valle:** Penas Blancas 22-Xi-1974–1. R. Wilkerson. Malaise Trap (♀: 1 FSCA). **ECUADOR: Tungurahua:** Banos 2,000m. 17-X-

1974. M. Cooper B.M.1975–33 (♂: 1 BMNH). Banos 2,000m. 21-X-1974. M. Cooper B.M.1975–33 (♂: 2 BMNH, 1 PMA). Banos. c.2,000m. 7-X-1978. M. Cooper B.M. 1979–20 (♀: 2 BMNH). Banos. c.2000m 19-XI-1978 M. Cooper B.M. 1979–20 (♂: 2 BMNH). Banos;—Tungurahua Norths.:2300m; Leg. R. Hensen et A. Ap- troot; 11–8–1982 (♂: 1 RNH).

Distribution.—(Map 22). Colombia, Ecuador.

4. *Llaqhastigmus colombianus*

Finnamore, new species

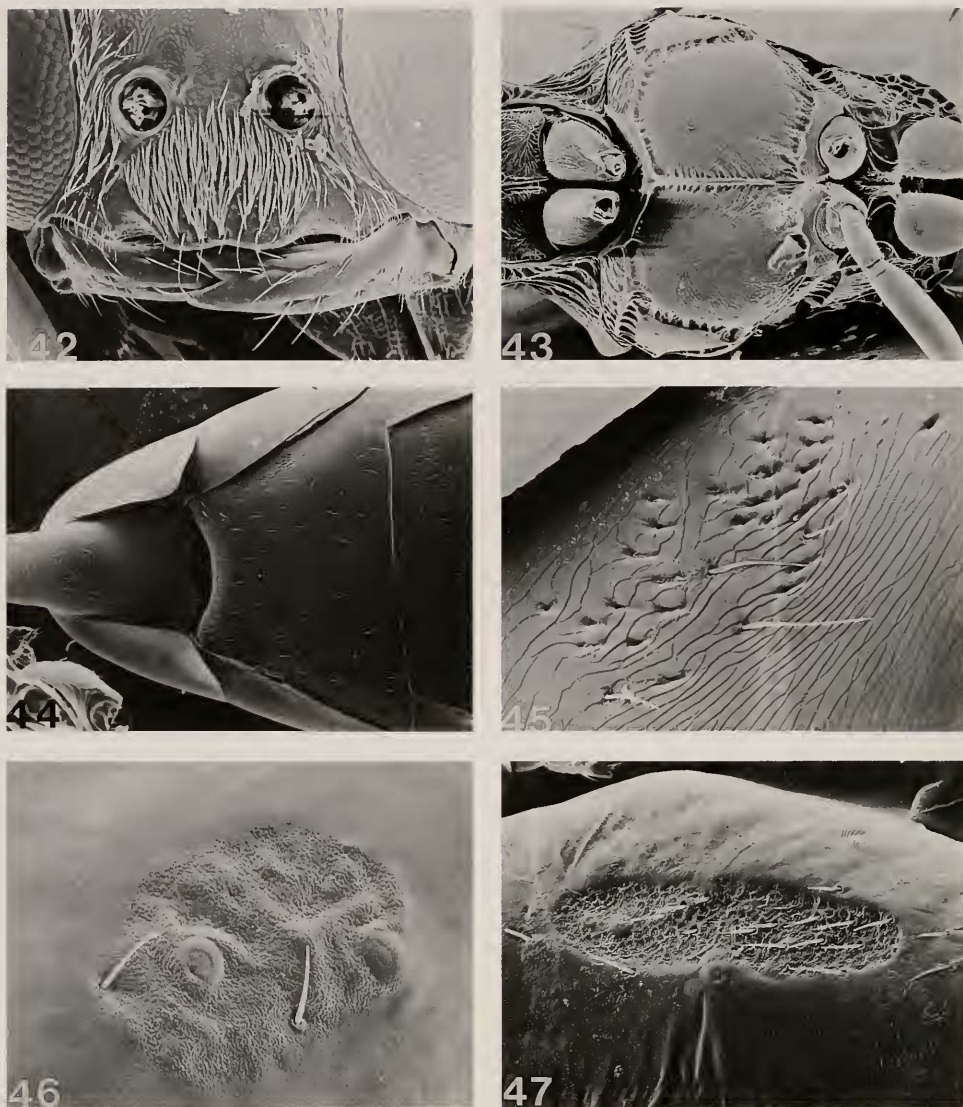
Derivation of Name.—The species epithet, *colombianus*, is derived from the country Colombia, where all specimens of this species have been collected.

Diagnosis.—The following combination will separate this species from others in the genus. Occipital carina foveolate ventrally, pronotum black except white pronotal lobe, coarsely foveolate scrobal sulcus usually with 3 or 4 large foveae and sulcus usually diminishing in width posteriorly, and female clypeus with fine punctures about 2 diameters apart and equally distributed on median third. This species is similar to *jatunkirus* and *sharkeyi* from which it differs with the coarsely foveolate scrobal sulcus and in the female with the homogeneously punctate median clypeal region.

Description.—Male. Length 3.9 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex. Occipital carina raised ventrally and foveolate.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum microsculptured, punctures sparse and relatively coarse. Transscutellar sulcus foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomalar present. Scrobal sulcus with 3 or 4 coarse foveae, sulcus



Figs. 42-47. *Stigmus*, *Tzustigmus* and *Incastigmus* 42, *Stigmus* sp. ♂, clypeus, showing lateral bevels. 43, *Stigmus* sp. ♂, mesosoma, ventral view. 44, *Tzustigmus syam* ♀, metasomal sternum 2. 45, *T. syam* ♀, micropore field on metasomal sternum 2. 46, *Incastigmus inti* ♂, micropore field on fore wing stigma. 47, *T. syam* ♀, micropore field on fore wing stigma.

entirely foveolate, somewhat narrower posteriorly. Sternopleural region weakly microsculptured, punctures and setae sparse almost absent from lower area. Propodeum shiny, area adjacent to enclosure and lateral sphere with several large areolae composed of relatively low carinae.

Metasoma. Petiole with several carinae laterally.

Color. Ground color black. White: pronotal lobe. Yellow-brown: palpi, mandible except apically, antenna, tegula, stigma, fore and mid legs except coxae, hind tarsus, apical metasomal tergum. Brown: hind leg except tarsus.

Female. Length 3.8-4.7 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate, much

larger than other teeth. Clypeal apex quadridentate as follows: lateral lobe flanking lateral edge of labrum, pair of smaller median teeth separated from lateral lobes by broad emarginations and separated from each other by broad U-shaped notch. Clypeal apex with specialized flattened, elongate, setae on teeth and most of emarginate interspaces; with 2 setae per median tooth, 3 per lobe and 3 on lateral emarginations. Clypeus shiny, without microsculpture, punctures sparse laterally but raised median area evenly and finely punctate with punctures up to 3 diameters apart, no part of median raised area without punctures. Apical clypeal margin black. Scutum sometimes without microsculpture on disc. Antenna and legs more brown than male.

Material Examined (1♂, 8♀).—Holotype ♀, COLOMBIA: Dept. Valle, Penas Blancas 1750m 10km w. Cali, very wet premontane forest, R.C. Wilkerson 29-I-1975 Malaise Trap (FSCA). Paratypes: **COLOMBIA: Antioquia:** Antioquia 1800m 13–22-IV-1973 (♀: 1 PMA). **Caqueta:** Florencia 480m 31-X-5-XI-1971 M. Cooper B.M. 1972–275 (♀: 1 BMNH). **Valle:** Pance 19-XI-1974–1 R. Wilkerson Malaise Trap (♀: 1 FSCA). Pance CVC (1700m) 15km w. Cali, very wet premontane forest, R.C. Wilkerson 23-XII 1974 (♂: 1 FSCA, ♀: 3 FSCA). Pance CVC (1700m) 15km w. Cali, very wet premontane forest, R.C. Wilkerson 28-X-1974 Malaise Trap (♀: 1 FSCA). Penas Blancas 21-XI-1974–3 R. Wilkerson Malaise Trap (♀: 1 FSCA).

Distribution (Map 23).—Colombia.

5. *Llaqhastigmus ecuatorialis* Finnamore, new species

Derivation of Name.—The species epithet is derived from a combination of the country of origin of the specimens, Ecuador, and the English word equator in reference to the distribution of the species.

Diagnosis.—The combination of a brown scape that is yellow-brown at base and apex, and a scrobal sulcus that is absent

or weakly impressed and without foveae will separate this species from all others in the genus. All other species, except *chutiyana* and *santanderanus* have the scape yellow ventrally and often a foveolate scrobal sulcus. *Llaqhastigmus chutiyana* has a black pronotal lobe while *santanderanus* lacks a subomaulus; *ecuatorialis* has a white pronotal lobe and a subomaulus is present. This species also has finely carinate sculpture on the propodeum adjacent to enclosure further distinguishing it from other species.

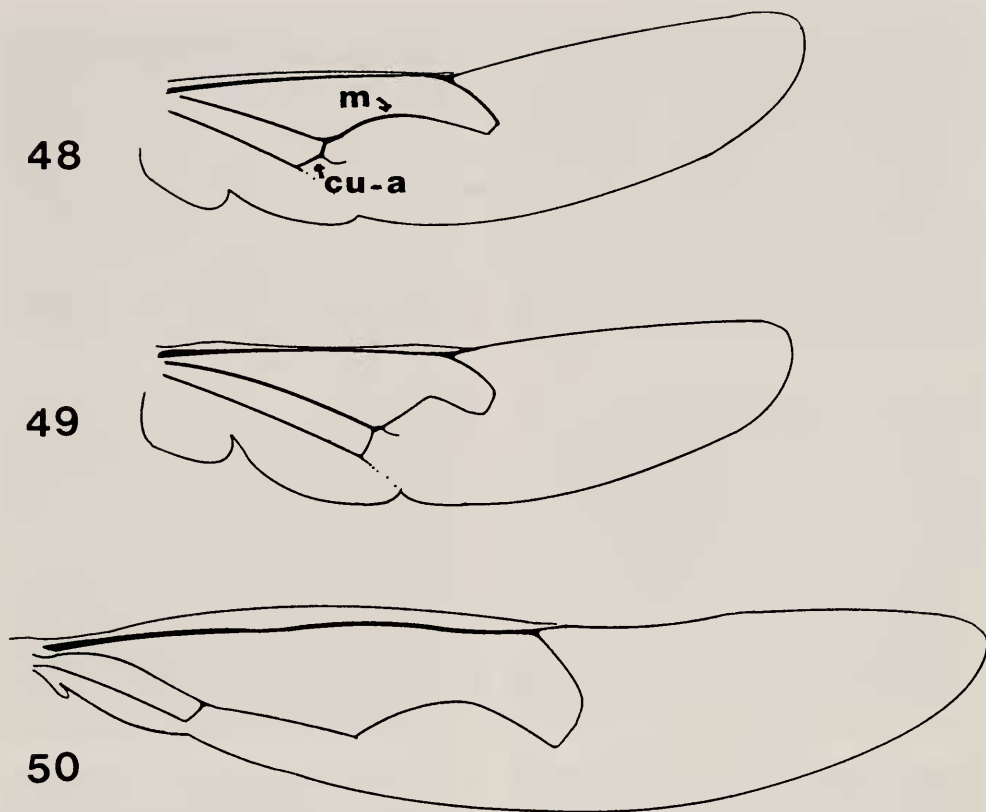
Description.—Male. Length 3.9–4.3 mm.

Head. Clypeal sculpture obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex. Vertex microsculpture in some specimens is unusually dense but never as dense as that of frons. Occipital carina ventrally raised and foveolate.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum microsculptured, with sparse scattered punctures. Transscutellar sulcus finely foveolate or foveae absent. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomaulus present. Omaulus present but in one specimen attenuated ventrally and not reaching acetabular carina. Scrobal sulcus evanescent, slightly impressed, not foveolate. Hypopimeral area microsculptured. Sternopleural region shiny without microsculpture, punctures and setae sparse. Propodeum with microsculpture especially outside enclosure, area adjacent to enclosure and propodeal side with fine irregular carinae which meet dorsolaterally to form small irregular areolae composed of low carinae.

Metasoma. Petiole with 3 or 4 carinae laterally.

Color. Ground color black. White: mandible basally, pronotal lobe. Yellow to yellow-brown: palpi, scape on basal and api-



Figs. 48–50. Stigmina, hind wing. 48, *Llaqhastignus*. 49, *Tzustignus*. 50, *Carinostignus*.

cal ring, sometimes pedicel, tegula, legs except coxae and femora. Brown: scape except basal and apical ring, femora.

Female. Length 4.5 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, much larger than other teeth. Clypeal apex quadridentate as follows: acutely triangular lateral tooth flanking lateral edge of labrum and surpassing median teeth; pair of smaller median teeth separated from lateral teeth by broad U-shaped emarginations and separated from each other by narrow U-shaped notch. Clypeal apex with specialized, flattened, elongate setae present on teeth but absent from most of emarginate interspace with the exception of single seta on emargination near lateral tooth. Clypeus shiny, with evanescent microsculpture on upper median area only,

punctures sparse and present only on median area. Lateral clypeal tooth red at apex. Both known females have omaulus which is attenuated ventrally and widely separated from acetabular carina. This character is variable in the male (omaulus usually intersecting acetabular carina) and may also be so in the female.

Material Examined (11♂, 2♀).—Holotype: ♂, ECUADOR: Los Duendes, S. Bolivar 10-VI-1965 Peña (MCZ). Paratypes: **ECUADOR: Imbabura:** Otavalo; -Quichinche-2700m Leg. R. Hensen et A. Aptroot 8–7–1982 (♂: 1 RNH). S. Otavalo 3300m I-8–9–1971 Luis E. Peña (♀: AEI). **Pichincha:** San Rafael ca. Quito 2500m 21–29-VI-1975 Col. C. Porter (♀: 1 LILLO). **S. Bolivar:** same data as holotype (♂: 6 MCZ, 1 PMA). **Tungurahua:** Banos, Tungurahua Norths. 2300m Leg. R. Hensen et A. Ap-

troot 11-8-1982 (♂: 1 RNH). Río Chota VI-10-1965 1800m Luis Peña. (♂: 1 AEI).

Distribution (Map 24).—Ecuador.

6. **Llaqhastigmus jatunkirus** Finnamore, new species

Derivation of Name.—The species epithet is derived from two Quechua words; "jatun" meaning large and "kiru" meaning tooth, referring to the enlarged apicoventral mandibular tooth in the female of this species.

Diagnosis.—The following combination of characters will separate this species from all others in the genus. Scape yellow-brown, vertex microsculpture of less density than that of frons, lower gena without modified setae, occipital carina raised ventrally and foveolate, transverse pronotal sulcus longitudinally carinate, pronotal lobe white, scutum microsculptured, submaulus present, preomalar area sparsely setose, scrobal sulcus impressed and finely if at all foveolate, and propodeum areolate on dorsolateral area outside enclosure. Females in addition to the foregoing, have the median clypeal area mostly impunctate apically and punctate basally.

Description.—Male. Length 3.7–5.0 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex adjacent to mid ocellus. Occipital carina ventrally raised and foveolate.

Mesosoma. Transverse pronotal sulcus with longitudinal carinae. Scutum microsculptured, punctures sparse with density and size variable. Transscutellar sulcus foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Submaulus present. Scrobal sulcus impressed with foveae variable from complete to absent, usually anterior half of sulcus weakly foveolate but rarely entirely foveolate or rarely without fove-

ae. Sternopleural region shiny, with at most evanescent microsculpture, punctures small and sparse, setae sparse. Propodeum shiny, area adjacent to enclosure and lateral sphere with several large, somewhat irregular areolae composed of low lying carinae; side without sculpture adjacent to enclosure.

Metasoma. Petiole with 3 or 4 coarse lateral carinae.

Color. Ground color black. White: palpi, pronotal lobe. Yellow-white: tarsi. Yellow to yellow-brown: mandible basally, scape and pedicel usually entirely but at least ventrally, basal flagellomeres ventrally, fore and mid legs except coxae and tarsi, sometimes hind tibia, tegula, tergum VI on apical half or more and VII, sternum VI and VII. Brown: usually hind leg except tarsi and occasionally tibia.

Female. Length 3.8–5.1 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate, much larger than other teeth. Clypeal apex quadridentate as follows: lateral lobe flanking edge of labrum, pair of median teeth separated from lateral lobe by broad emargination and separated from each other by U-shaped notch. Clypeal apex with specialized, flattened, elongate setae distributed on teeth and often in emarginate interspaces. Clypeus shiny, microsculpture absent, both lateral and median areas sparsely punctate and impunctate apicomediaally. Clypeal teeth black.

Material Examined (38♂ 63♀).—Holotype: ♀, VENEZUELA: Merida: Merida, Sta. Rosa 2000m 15-V-15-VI-1981 A. Briceño & F. Suarez (BRD). Paratypes: **BOLIVIA: La Paz:** Chulumani 1,700m. 25-III-1979 M. Cooper B.M. 1979-216 (♀: 2 BMNH). Chulumani 1,700m. 30-III-1979 M. Cooper B.M. 1979-216 (♂: 1 BMNH, ♀: 1 BMNH). Chulumani 1,700m. 2-IV-1979 M. Cooper B.M. 1979-216 (♀: 1 BMNH, 1 NMW). **COLOMBIA: Cauca:** Popayan, 1,800m. 10-X-1974 M. Cooper B.M. 1975-33 (♂: 2 BMNH, ♀: 1 BMNH). **Santander del Norte:** Prima 1,700m 29-V-1965 J. & B.

Bechyne (♀: 1 UCV). **Valle Prov.:** summit w. of Cali 6-II-1977 2000m M. Breed, C.D. Michener (♀: 1 SEM). **ECUADOR: Loja:** Loja III-23-26-1965 Luis Peña (♂: 1 AEI). **Pastaza:** 22km sw. Puyo 900m 14-16-VII-1976 S. & J. Peck, forest (♀: 2 BRD). Río Jumbeo (Zamora) 1-IV-1965 Peña (♂: 1 MCZ). **PERU: Cuzco:** Agua Calliente 21-28-XII-1983 L. Huggert (♀: 3 PMA). Machu Picchu 1900m. IX-4/19-1964 C.C. Porter (♀: 3 MCZ). Machu Picchu XI-29-1965 H. & M. Townes (♂: 1 AEI, ♀: 2 AEI). Machu Picchu XII-1-1965 H. & M. Townes (♂: 4 AEI, ♀: 4 AEI). Machu Picchu II-24-27-1968 A. Garcia & C. Porter (♀: 1 MCZ). Machu Picchu (ruins) 2400m 20-IV-1983 C. & M. Vardy B.M. 1983-217 (♀: 1 BMNH). **Huanuco:** Tingo Maria, 26 mi. e. XII-10-1954 1100m E.I. Schlinger & E.S. Ross (♀: 1 CAS). Tingo Maria, 40 mi. s. Carpath Mts. XII-28-1954 E.I. Schlinger & E.S. Ross (♀: 1 CAS). **Pasco:** Oxapampa 2,200m 6-III-1979 M. Cooper B.M. 1979-216 (♀: 1 BMNH). Oxapampa 2,200m 8-III-1979 M. Cooper B.M. 1979-216 (♂: 1 BMNH). **VENEZUELA: Lara:** Yacambu 1200m V-3-1981 H.K. Townes (♂: 3 AEI). Yacambu 1200m V-7-1981 H.K. Townes (♂: 6 AEI, ♀: 11 AEI). Yacambu 1200m V-10-1981 H.K. Townes (♀: 3 AEI). Yacambu 1200m V-13-1981 H.K. Townes (♀: 5 AEI). Yacambu N.P. 1200m cloud forest 7-V-1981 H. Townes (♂: 4 PMA, ♀: 2 PMA). Yacambu N.P. 1200m cloud forest 10-V-1981 H. Townes (♂: 2 PMA, ♀: 1 PMA, 1 BRD). Yacambu 1200m cloud forest 13-V-1981 H. Townes (♂: 3 PMA). **Merida:** Merida 1800m 11-V-1981 L. Masner 1984.149 (♂: 2 PMA, ♀: 7 PMA). Merida, small valley across R. Chama 6-V-1981 L. Masner 1984.157 (♀: 1 PMA). Merida, Sta. Rosa 2000m 3-13-V-1981 L. Masner pan t (♂: 1 PMA). Merida, Sta. Rosa 2000m 15-V-15-VI-1981 A. Briceno & F. Suarez (♂: 1 PMA). Merida, Sta. Rosa 2000m 15-VI-15-VII-1981 A. Briceno & F. Suarez (♂: 2 PMA). Merida, Sta. Rosa 2000m 15-VII-15-VIII-1981 A. Briceno & F. Suarez (♂: 2 PMA). Mucuy nr. Tobay 2200m cloud for-

est 5-V-1981 L. Masner (♂: 1 PMA). Tobay 2,200m IV-30-1981 H.K. Townes (♂: 2 AEI). Tobay 2,200m V-1-1981 H.K. Townes (♀: 1 AEI). Valle de Culata Ruta 7, 18-VII-1988 C. Porter & L. Stange (♂: 1 FSCA).

Distribution (Map 25).—Venezuela to Bolivia.

7. *Llaqhastigmus llutanis* Finnamore, new species

Derivation of Name.—The species epithet is derived from the Quechua "llutan" meaning strange, in reference to the unusual unsculptured transverse pronotal sulcus.

Diagnosis.—This species can be distinguished by the combination of the transverse sulcus of pronotum without carinae, propodeum with lateral sphere mostly unsculptured and crossed by only 1 or 2 low carinae, and female clypeal edge with elongate specialized setae along most of margin. This species is most similar to *sapanis* both of which differ from all others in the genus by their smooth unsculptured transverse pronotal sulcus. The other diagnostic characters will separate these 2 closely related species.

Description.—Male. Length 4.4–4.5 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex adjacent to mid ocellus. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse pronotal sulcus smooth, without sculpture. Scutum microsculptured, punctures sparse but occasionally relatively coarse. Transscutellar sulcus foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomalar present. Scrobal sulcus weakly impressed, smooth, not foveolate. Sternopleural region shiny to weakly microsculptured, punctures sparse. Propodeum shiny, area adjacent to

enclosure mostly unsculptured, lateral sphere crossed by at most a few low carinae forming large areolae.

Metasoma. Petiole with 2 fine carinae defining lateral region.

Color. Ground color black. White: palpi, pronotal lobe. Yellow to yellow-brown: mandibles except apically, scape, pedicel, at least ventrally on basal flagellomeres but sometimes entire undersides, fore and mid legs except coxae and femora, hind trochanter and tarsus. Brown: femora, hind tibia.

Female. Length 5.0 mm. Similar to male, except as follows: apicoventral mandibular tooth enlarged, truncate, much larger than other teeth. Clypeal apex quadridentate as follows: lateral lobe flanking lateral edge of labrum, pair of smaller median teeth separated from lateral lobe by broad emargination and separated from each other by narrow U-shaped notch. Clypeal apex with specialized, elongate, flattened setae distributed over all but median notch. Clypeus shiny, microsculpture absent, punctures dense laterally and sparse medially with impunctate area above median teeth. Apical clypeal margin red.

Material Examined (3♂, 1♀).—Holotype: ♀, PERU: Machu Picchu XI-30-1965 H. & M. Townes (AEI). Paratypes: **PERU: Cuzco:** Machu Picchu XI-29-1965 H. & M. Townes (♂: 1 AEI). Machu Picchu XI-30-1965 H. & M. Townes (♂: 1 AEI, 1 PMA).

Distribution (Map 26).—Peru.

8. *Llaqhastigmus mantanti* Finnamore, new species

Derivation of Name.—The species epithet *mantanti* is derived from two Quechua words, "manta" a preposition meaning "from" and "anti" meaning "east". The name refers to the distribution of this species in eastern Brazil.

Diagnosis.—The preomalar area sculpture that is obscured by setae in male and partially obscured by setae in female will separate this species from all others in the genus. Although females of this species

have the sculpture of the preomalar area only partially obscured by setae, they still have greater density of setae on the preomalar area than other species except for *shachus* which has elongate setae. Additionally almost all specimens of this species have some red coloration on the mesosoma. The red coloration is variable, rarely absent but almost always present on fore coxa and lateral pronotum and can extend over most of mesosoma except the propodeum. It is the only species in the genus with red on the mesosoma. Finally the female has an apicoventral mandibular tooth only slightly enlarged in comparison with the median and dorsal teeth. Females of all other species in the genus have a greatly enlarged apicoventral mandibular tooth. As a consequence of the small apicoventral mandibular tooth, females of this species can be confused with those of *Incastigmus*. The bilobed labrum with a small median notch indicate this species is a *Llaqhastigmus* rather than *Incastigmus* which has a quadrilobed labrum.

Description.—Male. Length 4.6–4.9 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex adjacent to midocellus. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse sulcus of pronotum carinate. Scutum microsculptured, sometimes shiny medially, punctures sparse, posterior margin with transverse row of short carinae. Transscutellar sulcus foveolate. Sculpture of preomalar area obscured by dense appressed setae that are usually continued along midventral line to mid coxae. Subomalar present. Scrobal sulcus impressed, foveolate. Sternopleural region shiny, weakly microsculptured, sparsely punctate, with increasing setal density ventrally. Propodeum usually microsculptured and usu-

ally with relatively small areoleae adjacent to enclosure that are composed of relatively coarse carinae. Some specimens have larger more typical areolae adjacent to enclosure.

Metasoma. Petiole, laterally smooth or with several fine carinae.

Color. Ground color black. White: palpi, base of mandible, pronotal lobe, at least fore tarsus, sometimes all tarsi. Yellow to yellow-brown: antenna, mandible medially, tegula, legs except at least fore tarsus and sometimes hind femur and tibia. Red: at least pronotal side to entire mesosoma except legs, pronotal lobe, tegula and propodeum; all males have some mesosomal red coloration. Brown: occasionally hind femur and tibia.

Female. Length 4.8–5.0 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, but only slightly larger than other teeth. Clypeal apex quadridentate with lateral lobe flanking lateral edge of labrum, pair of small median teeth separated from lateral lobe by broad emargination and separated from each other by U-shaped notch. Apical clypeal edge with specialized, elongate, flattened setae on teeth but not on emarginate interspaces (2 setae per median tooth and 4 per lateral lobe). Clypeus shiny, microsculpture absent, punctures variable from almost absent to sparsely distributed over entire surface.

Material Examined (6♂, 19♀).—Holotype: ♀, BRAZIL: Caruaru, Pernambuco 900m IV-1972 M. Alvarenga (BRD). Paratypes: **BRAZIL: Bahia:** 7-VIII-1983 Cepec Itabuna F.P. Benton (♀: 1 BMNH). **Guanabara:** Floresta da Tijuca IV-1966 Alvarenga & Seabra (♀: 1 AEI). Represa Río Grande, Guanabara XII-1967 F.H. Oliveira (♀: 1 BRD). Represa Río Grande I-1968 M. Alvarenga (♀: 2 PMA). Represa Río Grande II-1972 F.M. Oliveira (♀: 2 PMA). Represa Río Grande VII-1972 M. Alvarenga (♀: 2 BRD). **Minas Gerais:** Serra do Caraca, Sta. Barbara I-1970 (♀: 1 PMA). Serra do Caraca, S. Barbara III-1971 F.M. Oliv-

eira (♀: 1 PMA). **Parana:** Campina Grande nr. Curitiba II-23-1966 H. & M. Townes (♂: 1 AEI). **Pernambuco:** Caruaru IV-1972 M. Alvarenga (♀: 2 PMA). Caruaru V-1972. J. Lima (♀: 1 PMA). Curuaru [sic] 900m IV-1972 (♀: 1 BRD). **Río de Janeiro:** III-5-1966 H. & M. Townes (♀: 1 AEI). Guanabara II-1972. M. Alvarenga (♀: 1 PMA). Mangaratiba, Muriqui VII-1969 M. Alvarenga (♀: 1 AEI). Teresopolis III-12-1966 H. & M. Townes (♂: 1 AEI). **Santa Catarina:** Nova Teutonia 27°11'B.52°23'L. 8-X-1937 Plaumann. B.M.1938-312 (♂: 1 BMNH). **Sao Paulo:** Sao Paulo XII-31-1968 V.N. Alin (♂: 1 USNM). San Paulo 20-I-1978 [label in Russian] (♂: 2 ZMMU).

Distribution (Map 27).—Southeastern Brazil.

9. *Llaqhastigmus muthus* Finnamore, new species

Derivation of Name.—The species epithet is derived from the Quechua "muthu" which means dull, in reference to the degree of microsculpture found on members of this species.

Diagnosis.—The dense uniform microsculpture on the head (except clypeus) and mesosoma (except sometimes sternopleural region and propodeum) will separate this species from all others in the genus. In all other species the microsculpture of the frons is of greater density than that of the vertex.

Description.—Male. Length 3.5–4.0 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons and vertex of uniform (subequal) density. Occipital carina ventrally, slightly raised and finely foveolate.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum densely microsculptured, impunctate. Transscutellar sulcus foveolate. Preomallear area sparsely setose, setae not obscuring underlying sculpture. Subomaulus

present. Scrobal sulcus weakly impressed with evanescent usually irregular foveae best developed anteriorly. Sternopleural region densely microsculptured, impunctate. Propodeum weakly microsculptured to shiny; area adjacent to enclosure and lateral area carinate; carinae converging dorsolaterally to form small irregular areolae.

Metasoma. Petiole with several coarse carinae laterally.

Color. Ground color black. White: palpi, mandible except apically, pronotal lobe. Yellow to yellow-brown: scape, pedicel and basal flagellomeres ventrally, tegula, fore and mid legs except coxae, hind trochanter, hind tarsus. Brown: flagellomeres except as indicated above, hind leg except trochanter and tarsus.

Female. Length 3.7–4.6 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate, much larger than other teeth. Clypeal apex quadridentate as follows: lateral lobe flanking lateral edge of labrum, pair of smaller median teeth separated from lateral lobe by broad emargination and from each other by narrow U-shaped notch. Clypeal apex with specialized, elongate, flattened setae present on median teeth (2 per tooth) and on lateral lobe (6–7 per lobe) with occasionally single seta on emarginate interspace. Clypeus shiny, sparsely punctate, area immediately above median teeth impunctate and area between antennal sockets most densely punctate with punctures 1 diameter or less apart (elsewhere punctures 3 or more diameters apart). Lateral lobe yellow-brown to red-brown.

Material Examined (8♂, 16♀).—Holotype: ♂, PERU: Samne, ca. 40km ne. Trujillo, Prov. La Libertad 7°59's 78°41'w elev. ca. 1500m 12–17-VII-1975 C. Porter, L. Stange (LILLO). Paratypes: PERU: San Bartolome VII-1913 C.T. Brues (♂: 1 MCZ). **La Libertad:** same data as holotype (♂: 1 LILLO, 1 PMA). 15km e. Laredo 19-VII-1982 R.B. Miller, L. A. Stange (♂: 1

FSCA). **Lima:** Chancay shrubs nr. river 40 miles n. of Lima 29-VII-1971 P.S. & H.L. Broomfield B.M.1971–486 fertile irrigated region in arid coastal desert (♂: 1 BMNH). Chosica XI-1961 N.L.H. Krauss (♀ 1 USNM). Cupiche, 10km n. Chosica 25-VI-2-VII-1974 C. Porter & L. Stange (♂: 1 LILLO, ♀: 2 LILLO). Cupiche 26-VI-1976 C. Porter, C. Calmbacher (♂: 1 FSCA). Lima 13-XI-1950 E.S. Ross (♀: 2 CAS). Lima City, S. Marcos Univ. campus 26–27-IV-1983 Mal. trap C. & M. Vardy B.M.1983–217 (♀: 4 BMNH, 1 PMA). San Geronimo ca. Chosica 1–5-VII-1976 C. Porter, C. Calmbacher (♀: 3 FSCA). San Geronimo 30-VII-1982 R.B. Miller, L.A. Stange (♀: 2 FSCA). **VENEZUELA: Distrito Federal:** nr. Caracas 28-VIII-1943 D.G. Hall (♀: 1 USNM).

Distribution (Map 28).—Venezuela, Ecuador, Peru.

10. *Llaqhastigmus nigricollaris* Finnamore, new species

Derivation of Name.—The species epithet is derived from two latin words, niger and collaris, in reference to the dark pronotal collar characteristic of this species.

Diagnosis.—The combination of a brown or black pronotal lobe, antennal scape yellow-brown and in the female the apico-dorsal mandibular tooth (in addition to apicoventral tooth) enlarged and truncate, will separate this species from all others in the genus.

Description.—Male. Length 3.7–3.9 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex adjacent to mid ocellus. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum shiny, weakly microsculptured especially on disc, punctures sparse. Transscutellar sulcus foveolate. Preomalar area sparsely

setose, setae not obscuring underlying sculpture. Subomaulus present. Scrobal sulcus weakly impressed, irregularly foveolate anteriorly, occasionally entirely foveolate. Sternopleural region weakly microsculptured with sparse punctures and setae. Propodeum shiny, with several coarse areolae adjacent to enclosure composed of relatively high carinae.

Metasoma. Petiole with 2 to 4 coarse carinae laterally.

Color. Ground color black. Yellow to yellow-brown: palpi, mandibles medially, scape, pedicel and basal flagellomeres ventrally, tegula, fore and mid legs except coxae and usually except femora, hind trochanter and tarsus. Brown: mandible basally, antenna other than noted above, pronotal lobe, femora, hind tibia.

Female. Length 4.2–5.0 mm. Similar to male, except as follows: apicoventral and apicodorsal mandibular teeth enlarged, truncate. Clypeal apex quadridentate as follows: lateral lobe flanking lateral edge of labrum, pair of small median teeth separated from lateral lobe by deep, broad, emargination and from each other by shallow notch. Clypeal apex with specialized, flattened, elongate setae on lateral lobe (4 or 5) and on median teeth (2 per tooth) but generally absent on emarginate interspaces. Clypeus shiny, microsculpture absent, punctures sparse (3 or more diameters apart laterally, slightly more dense medially), lateral lobe red-brown.

Material Examined (2♂, 16♀).—Holotype: ♀, COLOMBIA: Valle Dept.: Penas Blancas 1750m 10km w. Cali, very wet premontane forest, R.C. Wilkerson 15-I-1975 Malaise trap (FSCA). Paratypes: COLOMBIA: **Cauca**: Popayan 1,800m 11-X-1974 M. Cooper B.M.1975–33 (1♂: 1 BMNH, ♀: 1 BMNH). **Valle**: Cali 900m 17-I-1972 M. Cooper B.M.1972–275 (♀: 1 BMNH). Pance CVC 1700m 15km w. Cali, very wet premontane forest, R.C. Wilkerson 23-XII-1974 Malaise trap (♀: 1 FSCA). Penas Blancas 1750m 10km w. Cali, very wet premontane forest, R.C. Wilkerson 23-

XII-1974 Malaise trap (♀: 1 FSCA). Penas Blancas 1750m 10km w. Cali, very wet premontane forest, R.C. Wilkerson 20–22-I-1975 Malaise trap (♀: 3 FSCA). Penas Blancas 1750m 10km w. Cali, very wet premontane forest, R.C. Wilkerson 31-I-1975 Malaise trap (♀: 3 FSCA, 1 PMA). Penas Blancas 12-II-1975 R. Wilkerson Malaise trap (♀: 3 FSCA, 1 PMA). Penas Blancas 17–19-III-1975 R. Wilkerson Malaise trap (♀: 1 FSCA). **ECUADOR: Napo**: El Chaco 2000m II-1983 M. Sharkey, L. Masner (♂: 1 BRD). **PERU: Huanuco**: Tingo Maria, 40 mi. s. Carpath Mts. XII-28–1954 E.I. Schlinger & E.S. Ross (♀: 1 CAS).

Distribution (Map 29).—Colombia, Ecuador, Peru.

11. *Llaqhastigmus santanderanus* Finnamore, new species

Derivation of Name.—The species epithet is derived from the Colombian state of Santander Del Norte, the northernmost record of the species.

Diagnosis.—The species is distinguished by the lack of a subomaulus, and a petiole that is finely carinate to microcarinate laterally. This species may prove to be conspecific with *australis*, at present there are too few specimens to assess variation within either species.

Description.—Male. Length 4.8–5.2 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons only slightly more dense than that of vertex. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse sulcus of pronotum with longitudinal carinae. Scutum microsculptured, punctures sparse, obscure. Transscutellar sulcus not, or at most obscurely foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomaulus absent. Scrobal sulcus slightly impressed, foveae absent or slightly evident anteriorly. Ster-

nopleural region microsculptured, sparsely punctate. Propodeum microsculptured, area adjacent to enclosure with fine irregular carinae, some small areolae dorsolaterally that are composed of fine, low carinae.

Metasoma. Petiole microcarinate laterally or with fine carinae laterally.

Color. Ground color black. White: mandible except apically, pronotal lobe. Yellow-brown: palpi, antenna, tegula, fore and mid legs except coxae, hind trochanter and tarsus. Brown: hind femur and tibia.

Female. Unknown.

Material Examined (2♂).—Holotype ♂, ECUADOR: Napo: Pastaza, Sebundoí, 2600m 11-15-IX-1977 L. Peña B.M.1978-293 (BMNH). Paratype: **COLOMBIA: Santander Del Norte:** Oroque 10-VI-1965 J.&B. Bechyne (♂: 1 UCV).

Distribution (Map 30).—Colombia, Ecuador.

12. *Llaqhastigmus sapanis* Finnamore, new species

Derivation of Name.—The species epithet is derived from the Quechua "sapan" meaning lone, in reference to the single known male specimen.

Diagnosis.—This species can be separated from all others in the genus with the following combination of characters: transverse sulcus of pronotum smooth and propodeum areolate dorsolaterally. The only other species known to have a smooth pronotal sulcus is *llutani* which differs from *sapanis* in its non-areolate propodeum.

Description.—Male. Length 3.8 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse sulcus of pronotum smooth, without carinae. Scutum

microsculptured, punctures relatively coarse and sparse (usually 3 or more diameters apart on disc). Transscutellar sulcus foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomalar present. Scrobal sulcus weakly impressed, not foveolate. Sternopleural region microsculptured, punctures sparse and evanescent. Propodeum microsculptured, area adjacent to enclosure and dorsolateral region areolate, areolae composed of relatively low carinae; side irregularly carinate.

Metasoma. Petiole carinate laterally.

Color. Ground color black. White: mandible except apically, pronotal lobe. Yellow-brown: palpi, scape, ventrally on pedicel and basal flagellomeres, tegula, fore and mid legs except coxae and femora, hind tarsus. Brown: antenna except as noted, fore and mid femora, hind leg except tarsus and coxa.

Female. Length 4.0–4.1 mm. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate, much larger than other teeth. Clypeal apex quadridentate as follows: lateral tooth flanking lateral edge of labrum, pair of smaller median teeth separated from lateral tooth by broad emargination and separated from each other by narrow U-shaped notch. Clypeal apex with specialized, flattened, elongate setae confined to teeth (2 per median tooth and 3 or 4 per lateral tooth). Clypeus shiny, without microsculpture, punctures sparse and relatively more dense between antennal sockets. Apical margin of clypeus black.

Material Examined (1♂, 4♀).—Holotype ♀, PERU: Machu Picchu XI-28-1965 H. & M. Townes (AEI). Paratypes: **BOLIVIA: Cochabamba:** Carrasco, Empalme 3000m II-1971 Fritz y Martinez (♂: 1 IIES). **PERU: Cuzco:** Machu Picchu XII-1-1965 H. & M. Townes (♀: 1 AEI). Machu Picchu II-24-27-1968 A. Garcia & C. Porter (♀: 2 MCZ).

Distribution (Map 31).—Bolivia, Peru.

13. **Llaqhastigmus shachus** Finnamore,
new species

Derivation of Name.—The species epithet is derived from the Quechua "sh'achu", meaning hairy in reference to the dense pilosity of this species.

Diagnosis.—This species can be distinguished by the presence of dense, elongate setae on the lower gena and sternopleural region. In the male, setae of lower gena are bent apically; in the female only a few near the hypostomal carina are bent apically. In both sexes the lower genal setae are longer than the greatest width of the fore basitarsus. Females of this species have a quadridentate mandible due to a deep U-shaped notch in the apicodorsal mandibular tooth (visible only by spreading the mandibles). All other species have tridentate mandibles and short sparse setae on the lower genal region. Setae in other species are never longer than greatest width of fore basitarsus. Other species have little or no setae on the sternopleural region.

Description.—Male. Length 4.4 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with dense elongate setae that are about twice the greatest width of fore basitarsus and bent 90° inward toward oral cavity. Microsculpture of frons slightly more dense than that of vertex. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse pronotal sulcus carinate. Scutum microsculptured, punctures small and sparse. Transscutellar sulcus foveolate. Subomaulus present. Preomaular area densely setose, setae erect not obscuring underlying sculpture. Scrobal sulcus weakly impressed, a few evanescent irregular foveae anteriorly. Sternopleural region weakly microsculptured, densely and minutely punctate (punctures about 2 diameters apart ventrally); setae dense ventrally and elongate, slightly shorter than genal setae and with many tips bent 90° toward posterior. Propodeum

weakly microsculptured, area adjacent to enclosure and dorsolateral sphere with numerous areolae composed of relatively low carinae, side more or less vertically carinate with carinae merging into areolae of dorsolateral sphere.

Metasoma. Petiole laterally, with 4 longitudinal coarse carinae.

Color. Ground color black. White: mandibles basally, pronotal lobe. Yellow-brown: Palpi, mandible medially, scape ventrally, tegula, fore and mid legs except coxae and femora, hind tarsus.

Female. Length 4.8–5.4 mm. Similar to male except as follows: mandible quadridentate, apicodorsal tooth with deep U-shaped notch thereby imparting quadridentate appearance to the mandible; apicoventral mandibular tooth enlarged, truncate, much larger than other teeth. Clypeal apex quadridentate as follows: lateral lobe flanking lateral edge of labrum, pair of median teeth separated from lateral lobe by broad emargination and from each other by U-shaped notch. Clypeal apex with specialized, flattened, elongate setae distributed over most of apex. Clypeus shiny, without microsculpture, punctures sparse (5–10 diameters apart). Apical clypeal margin black. Genal and sternopleural setae not as dense or as long as those in male. Omaulus ending ventrally, not continued forward to acetabular carina.

Material Examined (1♂, 2♀).—Holotype: ♀, PERU: Huanuco IX-16-1954 E.I. Schlinger & E.S. Ross (CAS). Paratypes: **ECUADOR: Loja:** 14km w. Catamayo 1770m 9-VII-1989 L. Stange & R. Miller (♀: 1 FSCA). **PERU: Huánuco:** Huánuco IX-16-1954 E.I. Schlinger & E.S. Ross (♂: 1 CAS).

Distribution (Map 32).—Ecuador, Peru.

14. **Llaqhastigmus sharkeyi** Finnamore,
new species

Derivation of Name.—This species is named in honour of Michael J. Sharkey, co-collector of the primary type material.

Diagnosis.—The combination of a white

pronotal lobe; shiny scutum with punctures minute and sparse, without microsculpture on posterior $\frac{2}{3}$ except narrow posterior margin; and a coarsely foveolate scrobal sulcus will separate this species from all others in the genus.

Description.—Male. Length 3.6–4.7 mm.

Head. Sculpture of clypeus obscured by dense appressed setae. Gena ventrally, with sparse straight setae that are subequal to or less than greatest width of fore basitarsus. Microsculpture of frons more dense than that of vertex. Occipital carina ventrally, raised and foveolate.

Mesosoma. Transverse pronotal sulcus with longitudinal carinae. Scutum shiny on most of posterior $\frac{2}{3}$, microsculptured anteriorly and narrowly on posterior margin; punctures minute, sparse, 10 or more diameters apart. Transscutellar sulcus foveolate. Preomalar area sparsely setose, setae not obscuring underlying sculpture. Subomalar present. Scrobal sulcus impressed, foveolate. Sternopleural region shiny, without microsculpture, punctures minute and sparse. Propodeum shiny, without microsculpture, area adjacent to enclosure and lateral sphere with areolae composed of relatively high carinae; side unsculptured toward metapleuron.

Metasoma. Petiole carinate laterally.

Color. Ground color black. White: pronotal lobe. Yellow to yellow-brown: palpi, mandible medially, scape, pedicel, ventrally on basal flagellomeres or more, tegula, fore and mid legs except coxae, hind tarsus. Brown: antennal flagellum except as noted above, hind leg except tarsus.

Female. Length 4.2–4.6. Similar to male except as follows: apicoventral mandibular tooth enlarged, truncate, much larger than other teeth. Clypeal apex quadridentate as follows: lateral tooth flanking lateral edge of labrum, pair of smaller median teeth separated from lateral tooth by broad emargination and separated from each other by narrow U-shaped notch. Clypeal apex with 5 or 6 specialized, elongate, flattened setae equally distributed

along edge except for median teeth which bear 2 additional setae each. Clypeus shiny, punctures minute but dense laterally and larger and more sparse medially (1 to 2 diameters apart). Apical margin of clypeus black.

Material Examined (4♂, 4♀).—Holotype: ♂, ECUADOR: Napo Prov.: Baeza, 5km s. II-1983 2000m Sharkey, Masner (BRD). Paratypes: **COLOMBIA: Santander del Norte**: Prima 1700m 27-V-1965 J. & B. Bechyne (♀: 1 UCV). **ECUADOR: Napo**: Baeza, 5km s. II-1983 2000m Sharkey, Masner (♀: 1 BRD). El Chaco 2000m II-1983 M. Sharkey, L. Masner (♂: 1 PMA). Pastaza, Reventador 1750m 3–5-X-1977 L.E. Peña B.M.1978–293 (♂: 1 BMNH). **VENEZUELA: Aragua**: Hac. Portapan 1700m 15-VIII-1969 J. & B. Bechyne (♀: 1 UCV). Rancho Grande 1100m 16-XI-1967 J. & B. Bechyne (♀: 1 UCV). Rancho Grande, Portachuelo 1100m 22-V-1981 J.A. Clavijo, J.L. Garcia (♂: 1 UCV). **Falcon**: Curimagua 1400m 1-XII-1971 J. & B. Bechyne (♀: 1 UCV).

Distribution (Map 33).—Ecuador, Colombia, Venezuela.

GENERIC RELATIONSHIPS

The following hypothesis of relationships of genera among the Stigmina is based on outgroup analysis of character state distribution. The characters listed below were polarized by outgroup analysis with the Spilomenina. Morphology is after Bohart and Menke (1976) unless otherwise indicated in introduction, only characters not sufficiently treated by those authors are explained in detail below. In the following analysis 0 denotes the plesiotypic state and 1 to 5 denote various apotypic expressions of a character and do not necessarily represent transition series. Data matrices for the Stigmina, Pemphredonina, Spilomenina, and Ammoplanina are presented in Tables I–IV respectively. A cladogram illustrating relationships is presented in Fig. 51. The cladogram is based

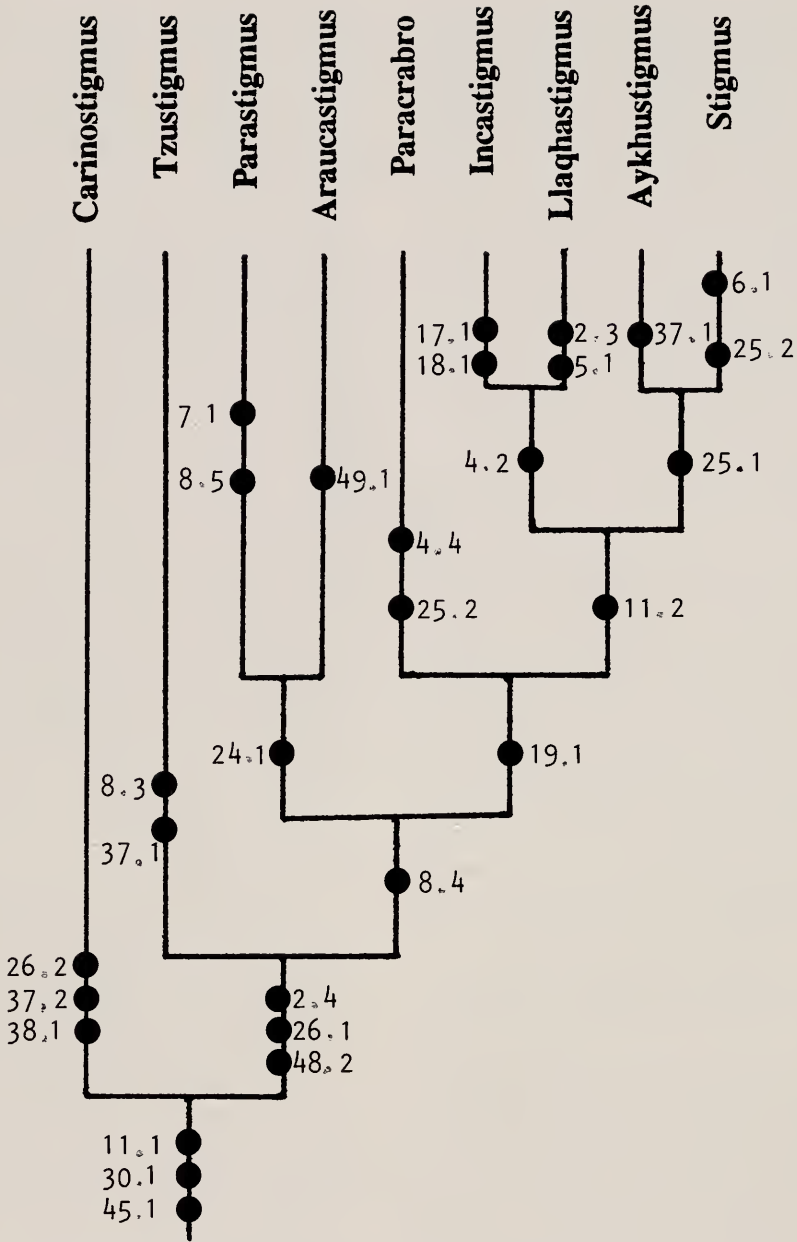


Fig. 51. Cladogram depicting relationships among genera of Stigmina.

on the following characters and was developed without electronic assistance.

Character Polarization

1. Palpal formula.

0—Palpal formula 6-4, palpal segments long, palpi conspicuous. Found in the

Stigmina and the Pemphredonina, palpal segment length generally exceeds twice its width, palpi greatly exceed hypostomal carina.

1—Palpal formula 6-4, palpal segments short, palpi inconspicuous. Found in the Ammoplanina (genera examined: *Pulver-*

ro, *Ammoplanus*, *Ammoplanops*, *Parammoplanus*, *Ammoplanellus*, *Timberlakena*), palpal segment length generally about twice its width or less, palpi at most slightly exceed hypostomal carina.

2—Palpal formula 5-4, palpal segments short, palpi inconspicuous. This character is synapomorphic for the Spilomenina and was the justification used by Menke (1989) to separate the group from the Stigmata. Palpal segments are short, particularly basal segments which may be no longer than wide, palpi at most slightly exceed hypostomal carina.

2. Labrum shape.

0—Labrum truncate to broadly rounded, wider than long. This character state is found in *Arpactophilus*, *Microstigmus*, *Xysma*, *Pulverro*, *Ammoplanops*, and many other apoid and vespoid wasps. This character state in the genera listed above may represent a reversal from 2.3 or 2.4. Only a few species and specimens were available for dissection in these groups, furthermore the difference between truncate and broadly rounded is sometimes slight, rendering the polarity of this character especially difficult to establish.

1—Labrum triangular, longer than wide. Present in *Pemphredon*, *Polemistus*, and *Carinostigmus*, as well as most Ampulicinae (*Ampulex*) and Ammophilini (Sphecinae). Sides of triangle are out-curved, basal and apical regions are not distinguished. This state may represent the correct plesiotypic expression of the labrum in the Pemphredonini.

2—Labial apex distinguished from base. In *Passaloecus* the lateral margins of the labrum are incurved resulting in a state in which the base is abruptly broadened and thereby distinguished from the apex. The abrupt shoulder is present, although modified, in all genera listed under 2.3, 2.4, and presumably 2.5 although I have not seen specimens of the latter.

3—Labrum emarginate to bilobed. This development ranging from a slight emar-

gination found in *Paracrabro* to the deeply bilobed expression found in *Diodontus*, *Llaqhastigmus*, *Arpactophilus*, *Ammoplanus*, *Parammoplanus*, *Ammoplanellus*, *Timberlakena* and as well is present in those genera listed under 2.4. The labrum of *Llaqhastigmus* is considered a character reversal from 2.4 caused by a reduction of the median lobes.

4—Labrum 4-lobed. This character state results from an apical shift of the lateral shoulders (see character state 2.2 above) imparting a 4-lobed appearance to the labrum. Found in *Stigmus*, *Tzustigmus*, *Arcaucastigmus*, *Parastigmus*, *Aykhustigmus*, *Incastigmus*, *Arpactophilus*, and *Spilomena*.

5—Labrum 6-lobed. I have not seen specimens bearing this character. Menke (1989) noted undescribed *Arpactophilus* having a "six toothed labrum".

3. Mandibular socket.

0—Open.

1—Closed.

4. Apical mandibular teeth.

0—Mandible with 2 apical teeth. This character state is found in males of all genera of Stigmata, except *Incastigmus* and *Llaqhastigmus*, it also occurs in both sexes of all genera in the Spilomenina and sporadically in all genera of the Pemphredonina.

1—Mandible unidentate, apically terminating in a single point or truncate.

2—Mandible tridentate apically (Figs. 37, 39). Females of most genera of Stigmata (except *Parastigmus*, *Paracrabro* and some *Stigmus*) and males of *Incastigmus* and *Llaqhastigmus*. The character state also occurs in some species of *Passaloecus* and *Pemphredon*.

3—Mandible with 4 apical teeth.

4—Mandible with 5 apical teeth.

5—Mandible with 6 apical teeth.

5. Apicoventral mandibular tooth in females having a tridentate mandible (character 4.2).

0—Apicoventral tooth acute, similar in size to other teeth (Fig. 39).

1—Apicoventral tooth enlarged and truncate (Fig. 37). This character state occurs in females of *Llaqhastignus* and independently in females of some *Pemphredon*.

6. Clypeal apicolateral bevel.

0—Clypeus unmodified apicolaterally.

1—Clypeal apex bevelled apicolaterally (Fig. 42). The lateral clypeal bevel is an autapotypic character state occurring in *Stigmus*. It occurs only in males and is most developed in species from the Neotropical Region.

7. Clypeus size.

0—Clypeus not reduced, antennal socket usually more than its diameter from nearest clypeal edge; labrum generally flat, lightly sclerotized, mostly or entirely obscured. Found in males and most females.

1—Clypeus reduced, antennal socket about its diameter from nearest clypeal edge, labrum convex, heavily sclerotized, entirely exposed, or almost so. Some females of a few genera.

8. Clypeal teeth.

0—Clypeus without teeth or lobes on apical margin.

1—Clypeus with single median tooth or lobe.

2—Clypeus with 2 median teeth.

3—Clypeus with 3 teeth.

4—Clypeus with 4 teeth.

5—Clypeus with 2 lateral teeth, median teeth lost.

9. Interantennal tubercle.

0—Reduced or absent, usually represented by a small, raised conical point, seldom exceeding half width of antennal scape (Fig. 36).

1—Protruberant, often exceeding width of antennal scape (Figs. 6, 7).

10. Frontal carina.

0—Frontal carina absent, indicated by a groove, complete or in part, from midocellus to clypeus.

1—Frontal carina absent, frons flat, without indication of groove or carina.

2—Frontal carina present as a simple raised line, complete or in part, from midocellus to ocellus.

3—Frontal carina strongly raised, lamellate, usually between antennal sockets.

11. Vertex micropore field.

0—Vertex, between lateral ocellus and eye, of similar microsculpture and punctation to adjacent areas; without group of loosely associated punctures or discrete pore field.

1—Vertex, between lateral ocellus and eye, with a loosely associated group of punctures (Figs. 3, 8).

2—Vertex, between lateral ocellus and compound eye, with a micropore field, appearing as a discrete patch of fine microsculpture relative to adjacent microsculpture (Figs. 19, 20, 25, 26, 31, 32).

12. Eye margins.

0—Eye not margined by a carina.

1—Eye at least partially margined by a carina.

13. Occipital Carina.

0—Occipital carina present, simple.

1—Occipital carina raised, foveolate.

2—Occipital carina incomplete dorsally, present ventrolaterally.

3—Occipital carina absent.

14. Occipital-hypostomal carinae.

0—Occipital carina intersecting hypostomal carina.

1—Occipital carina ending ventrally not intersecting hypostomal carina.

2—Occipital carina forming a complete circle, not intersecting hypostomal carina.

15. Pronotal collar.

0—Pronotal collar of normal length, transverse sulcus without median longitudinal raised area (Figs. 7, 10).

1—pronotal collar elongate, transverse sulcus with median longitudinal area raised (Figs. 2, 5).

16. Transverse pronotal carina.

0—Present, at least laterally.

1—Absent.

17. Median scutal groove.

0—Scutum without median groove or pit (Figs. 38, 41).

1—Scutum with a median groove or at least a median posterior pit (Figs. 33, 35).

18. Notaular grooves.

0—Notaular grooves unmodified, present anterolaterally (Figs. 38, 41).

1—Notaular grooves elongate, often to posterior margin of scutum (Figs. 33, 35).

19. Acetabular carina.

0—Acetabular carina absent (Fig. 11).

1—Acetabular carina present (Fig. 43).

20. Omaulus.

0—Omaulus present.

1—Omaulus absent.

21. Episternal sulcus.

0—Episternal sulcus present.

1—Episternal sulcus absent.

22. Hypersternaulus.

0—Hypersternaulus present.

1—Hypersternaulus absent.

23. Orientation of hypersternaulus.

0—Obliquely oriented.

1—Horizontally oriented.

24. Scrobal sulcus.

0—Present (Fig. 34).

1—Absent (Fig. 14).

25. ♂ midbasitarsus.

0—Midbasitarsus elongate, longer than remaining tarsomeres combined.

1—Midbasitarsus, straight, cylindrical, shorter than remaining tarsomeres combined.

2—Midbasitarsus short, modified—curved, excavated, expanded or combinations thereof.

26. Hindtibial spines.

0—One or more rows of spines on posterior surface.

1—2–4 widely separated spines on posterior surface.

2—Without spines on posterior surface.

27. Propodeal enclosure.

0—Present.

1—Absent.

28. Stigma size.

0—Stigma of fore wing of normal size, smaller than marginal cell.

1—Stigma of fore wing enlarged about size of marginal cell or larger.

29. Stigma shape.

0—Stigma of fore wing broadly lenticular.

1—Stigma of fore wing subglobular.

30. Stigma micropore field.

0—Stigma of fore wing without micropore field, dorsal surface uninterrupted.

1—Stigma of fore wing with micropore field, appearing as a discrete circular or elliptical microsculpture patch interrupting dorsal surface (Figs. 46, 47).

31. Marginal cell size.

0—Marginal cell not reduced, larger than stigma.

1—Marginal cell reduced, smaller than stigma.

32. Marginal cell veins.

0—Marginal cell closed.

1—Marginal cell open.

33. Submarginal cells.

- 0—Two submarginal cells.
- 1—One submarginal cell.
- 2—Submarginal cells absent.

34. Submarginal cell position.

0—Outer veinlet of submarginal cell 1 out of line with outer veinlet of marginal and discoidal cells.

1—Outer veinlet of submarginal cell 1 in line with outer veinlet of marginal and discoidal cells.

35. Submarginal cell I veins.

- 0—Submarginal cell I closed.
- 1—Submarginal cell I open.

36. Discoidal cell number.

- 0—Fore wing with three discoidal cells.
- 1—Fore wing with two discoidal cells.
- 2—Fore wing with one discoidal cell.

37. Hind wing media divergence.

0—Hind wing media diverging before or at cu-a.

1—Hind wing media diverging just after cu-a.

2—Hind wing media diverging far after cu-a.

38. Hind wing submedian cell.

0—Hind wing submedian cell about half or more length of median cell.

1—Hind wing submedian cell about one third length of median cell.

39. Hind wing cells.

- 0—Closed cells present in hind wing.
- 1—Hind wing without closed cells.

40. Petiole length.

0—Petiole undeveloped, abdomen sessile.

1—Petiole developed, composed of sternum only, wider than long. Some *Microstigmus* approximate this character state but the apparent petiole is composed of both tergum and sternum.

2—Petiole developed, composed of sternum only, longer than wide.

41. Petiolar sculpture.

0—Petiole carinate—2 or more longitudinal carinae.

1—Petiole punctate.

2—Petiole smooth and round.

42. Sternum I carinae.

0—Metasomal sternum 1 without basal carinae.

1—Metasomal sternum 1 with single basal medial carina.

2—Metasomal sternum 1 with two basal median carinae.

43. Sternum 1 basal groove.

0—Metasomal sternum 1 basal transverse groove undeveloped.

1—Metasomal sternum 1 with a transverse groove or constriction just posterior to base.

44. Tergum 1 lateral carina.

0—Metasomal tergum 1 with a lateral carina.

1—Metasomal tergum 1 lateral carina absent.

45. Sternum 2 microsetal patches.

0—Metasomal sternum 2 without microsetal patches.

1—Metasomal sternum 2 with discrete microsetal patch laterally (Figs. 44, 45).

46. Pygidial Plate.

0—Pygidial plate present, broad.

1—Pygidial plate present, narrow, trough-like.

2—Pygidial plate absent.

47. Male Sternum 8.

0—Metasomal sternum 8 broad, not narrowed apically.

1—Metasomal sternum 8 triangular, gradually narrowed apically.

2—Metasomal sternum 8 narrowly triangular, base differentiated from apex.

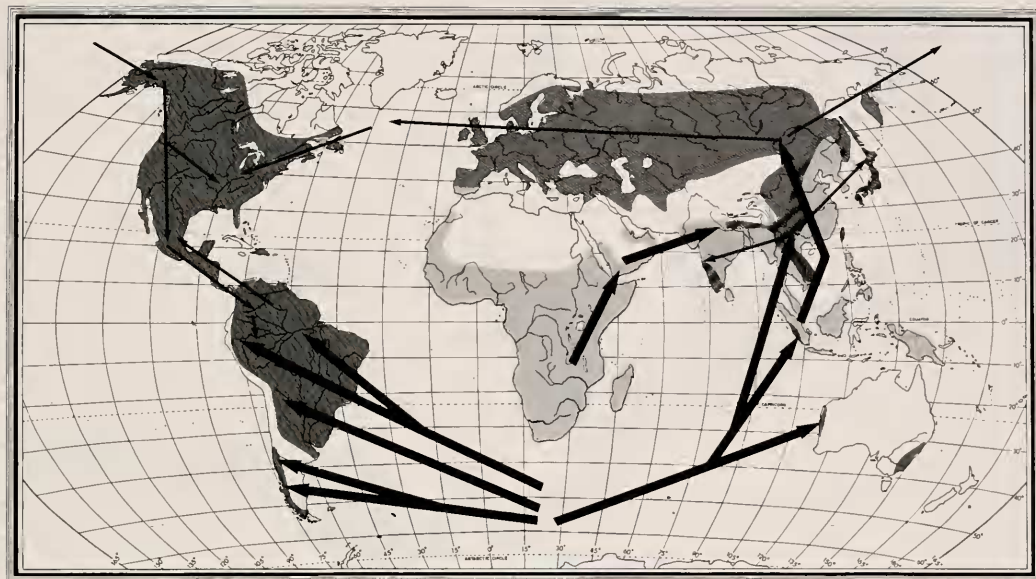


Fig. 52. World distribution and post continental drift dispersal routes for *Carinostigmus* (light shading) and other genera in the Stigmina (dark shading). Wide lines indicate generic level dispersals, narrow lines indicate species group dispersal.

3—Metasomal sternum 8 abruptly narrowed, apical portion forming a pseudosting, elongate and parallel-sided.

4—Metasomal sternum 8 spatulate apically.

48. Genitalia.

0—Digitus and cuspis lobular, more or less equal in length.

1—Digitus, elongate-triangular, longer than cuspis.

2—Digitus elongate, sides parallel, greatly exceeding cuspis.

49. Microsculpture.

0—Present on most of body, dull.

1—Absent, body shiny.

DISCUSSION

The relationship of subtribes within the Pemphredoninae remains the same as that presented in Bohart and Menke (1976). The sister subtribe to the Stigmina is presumed to be the Spilomenina, based on the shared presence of a 4-lobed labrum (character 2.4 above). The Ammoplanina

(synapotypies: loss of transverse pronotal carina 16.1 and loss of omaulus 20.1) is considered immediate outgroup to the Stigmina + Spilomenina based on the synapotypic presence of an enlarged fore wing stigma. The immediate outgroup to the Stigmina + Spilomenina + Ammoplanina is the Pemphredonina based on the synapotypic loss of the third submarginal cell and the presence of specialized setae on the apicomedial clypeal apex in females. The Pemphredoninae are in need of critical cladistic analysis.

In the Stigmina the analysis of characters resulted in three equally parsimonious solutions. Electronic analysis of the data would have undoubtedly resulted in many more. The cladogram (Figure 51) was selected on the basis of the best fit with plate tectonics. The recognition of new genera was based on the cladistic analysis coupled with biogeography and morphology. Morphological distinctions for genera are consistent with those for genera in Bohart and Menke (1976). A dendrogram placing *Paracrabro* in a posi-



Fig. 53. Distribution of 27 species of *Stigmina* in the Caribbean.

tion basal to *Carinostigmus* and *Stigmus* was presented by Bohart and Menke (1976). The presence of a number of apotypic character states suggest that the arrangement presented here with *Carinostigmus* in the basal position, is correct. These character states include the presence of an acetabular carina, a clypeus with four teeth on the apical margin, two to four spines on the posterior surface of the hind tibia, and an elongate digitus that greatly exceeds the length of the cuspis.

A composite distribution map of the *Stigmina* is presented in Fig. 52, *Carinostigmus* is plotted against all other genera in the *Stigmina*. The presence of genera on two southern hemisphere continents and their absence on other continents is indicative of a group radiating at the time of continental separation. *Carinostigmus* is restricted to the Old World, generally southern hemisphere (based on large numbers of undescribed species from southern regions) but is absent from Australia (an

introduced species is present in New Guinea). The other genera occur in the western hemisphere (*Araucastigmus*, *Aykhestigmus*, *Incastigmus*, *Llaqhastigmus*, *Parastigmus*, *Stigmus*), across the Palaearctic Region with several outliers on the east asian islands and the orient (*Stigmus*, *Tzustigmus*), and Australia (*Paracrabro*). The only major zone of contact between *Carinostigmus* and the other genera is in the Oriental Region; a minor contact zone occurs in southern Spain. Elsewhere *Carinostigmus* is separated from the other genera by the Himalayas, the Gobi and Sahara Deserts, and the Atlantic Ocean.

Outliers in Chile, India, Thailand, Japan, Taiwan, Vietnam, Sumatra and Australia represent distributions of relict genera and species. The only anomaly is the presence of *Carinostigmus* in New Guinea which probably represents a recent introduction. The *Stigmina* are restricted in distribution by 2 primary barriers, those of xeric conditions and water. The effect of xeric con-

ditions is evident in Fig. 52 with the absence of genera from major desert regions (some exceptions in the New World). The effect of water is evident in the Caribbean fauna (Fig. 53). This composite distribution map of 27 species shows only 7 species on the Caribbean Islands, of those six occur within the area influenced by the Orinoco River current where 3 are endemic (including *Incastigmus thoracicus*). A fourth endemic species (an undescribed *Stigmus*) occurs on Hispaniola. Many of the islands of the Lesser Antilles are within sight of neighbouring islands. The failure of the Stigmina to traverse these short distances is indicative of the effectiveness of water as a barrier to dispersal and also to the lack of long distance dispersal mechanisms within this group. This point must be born in mind when attempting to interpret the present distribution patterns of genera. If there was not, at some time in the past, an overland route between points presently separated by water, then it is unlikely that species of Stigmina would disperse between those points.

In South America *Stigmus* has a C-shaped distribution restricted to the highlands surrounding the Amazon basin and restricted by the lowlands of the Río Pirana in the south. *Araucastigmus* (Map 35) is restricted to Chile, for the most part to the Pacific side of the continental divide and to the north restricted by extreme desert conditions. There are 3 species, and thanks to Lubomir Masner, an abundance of specimens. *Parastigmus* (Map 34) occurs on the east side of the divide although 1 species, the most plesiotypic in the genus occurs in Chile, possibly indicating a common regional origin. In Argentina *Parastigmus* appears to follow the distribution of grassy steppe vegetation surrounding the xeric vegetation of Patagonia. The genus is represented by 4 species known from 16 specimens. *Aykhustigmus* (Map 36), represented by 4 species known from 37 specimens, occurs in the Brazilian Highlands south to the Río Pirana and the

15.5°C mean July isotherm. The only exception is a single specimen recently collected from the Venezuelan state of Zulia believed to be an introduction. *Llaqhastigmus* (Map 37) follows a distribution similar to but not as extensive as *Stigmus*. Thirteen species are confined to the Andes while a single species occurs across the Brazilian Highlands. *Llaqhastigmus* is not known from the Guyana Shield but could well occur there. *Incastigmus* with 25 species is not only the largest Neotropical genus but has the broadest distribution. It is limited in the south by the 15.5°C mean July isotherm, on the west by xeric conditions and to the north by the 10°C mean January isotherm which is the approximate boundary of the Nearctic and Neotropical Regions. The composite map (Fig. 54) demonstrates the limiting influences of winter temperatures and rainfall on the distribution of Stigmina in the Neotropics.

About 200 million years ago a single landmass stretched from pole to pole, Laurasia to the north, Gondwanaland to the south. The central part of this great landmass was dominated by xeric conditions. Areas of rainforest existed in the extreme south (southern South America, South Africa, Antarctica and Australia), seasonal or monsoon rains existed in the mid latitudes (southeast Asia, Arabian Peninsula) (Lamb 1977). Superimposed on these extremes of wet-dry conditions were areas of exposed basement layer or granite shield characterized by localized or edaphic aridity (Axelrod 1972). Similar conditions occur today in the Tipui system of the Guiana Shield. The predrift uplifting of the continents along rift lines allowed water to flow east and west from the South American-African divide thereby slowly exposing the basement layer through erosion. The exposure of the basement layer in this region has probably had more consequences for floral and faunal radiation than any other single post drift event.

The Stigmina belong to the apoid lin-



Fig. 54. Composite distribution of *Incastigmus*, *Araucastigmus*, *Parastigmus* and *Aykhustigmus* in the Neotropical region.

eage (Apoidea) of Hymenoptera, of which bees form the dominant component. There is a well known coevolutionary relationship between bees and angiosperms. The earliest flowers were probably beetle pollinated (Michener 1979). Bees were probably an already diversified west gondwanan group of sandnesting lineages (Michener 1979) by the time the first flowering plants (Magnoliaceae) spread southward from Laurasia (Raven and Axelrod

1974). Michener (1979) for bees, and Axelrod (1972) and Raven and Axelrod (1974) for angiosperms hypothesize a xeric west Gondwanaland radiation of these groups. The influences of interior xeric conditions, thousands of island-like patches of arid exposed basement layer, along with a group of wasps (bees) preadapted for pollination contributed to an explosive radiation of bees and angiosperms.

Conversely the southern rainforests pre-

sented a habitat unsuitable for sand nesting organisms perhaps because of high water tables, high humidity and the likely persistence of fungi in brood cells. I hypothesize that twig-nesting behaviour developed early in the apoid lineages as a response to increasingly wet conditions to the south. It is also likely that twig-nesting developed more than once since there are several apparently unrelated types of aerial nest architecture. It is the twig nesting groups that reach the greatest diversity in the rainforests today. Lineages of bees, and the *Stigmina* likely radiated from one or the other of the two extreme gondwanaland ecosystems. Modern distributions show presumed relict bees inhabiting south temperate xeric areas while presumed relict *Stigmina* inhabit south wet temperate or tropical rainforest. Based on present-day distribution and on the hypothesized relationships between genera, the *Stigmina* probably existed prior to continental breakup, over 200 million years ago. Some support is lent to this statement by the existence of specialized pemphredonine fossils in the Upper Cretaceous, about 135 million B.P. (Evans 1969, 1973). *Stigmina* at the time of continental breakup would likely have occurred in the southern rainforests (southern South America, South Africa, Antarctica, Australia) and in the southern savanna surrounding the midcontinental xeric area.

Of pivotal importance in this analysis is a report on the tectonics of the Indonesian region (Hamilton 1979). Hamilton presents evidence of Jurassic (180 million B.P.) rifting of eastern Gondwanaland. Present-day land masses of Thailand, Burma, Malaysian Peninsula, Sumatra and Borneo rifted from the northern Australia–New Guinea–Antarctica continental margin and moved north to collide with the Eurasian plate. Furthermore Audley-Charles (1987) found an uninterrupted pollen record indicating the craton was not submerged during its northward jour-

ney and likely introduced Gondwanaland flora and fauna into Southeast Asia. If this tectonic event occurred, then gondwanaland flora and fauna (*Stigmina*) could be introduced to the Laurasian continent at a very early period. This would allow the lineages of *Stigmina* to be in a position to colonize the Nearctic Region via Europe and Beringia at 65 million B.P.

The rifting of South America from Africa commenced during the same period (180 million B.P.) and resulted in the separation of southern Africa from southern South America by a narrow body of water. The inability of the *Stigmina* to cross a water barrier is instrumental in my explanation of the absence of genera other than *Carinostigmus* from Africa. Although India likely once held more genera of *Stigmina* than it does today, that fauna was almost certainly lost when the craton travelled over a hot spot in the crust on its northward journey. Severe volcanism on the Indian plate likely caused extinction of biota in virtually all its ecosystems. What fauna the plate brought to Asia is probably the result of a brief encounter with north Africa before colliding with Asia about 45 million years B.P. By the late Cretaceous Period (135 million years B.P.) *Stigmus* and *Tzustigmus* probably colonized Laurasia. The Nearctic fauna consists of eastern and western species groups likely the result of colonization by *Stigmus* via both Europe and Beringia about 65 million years B.P.

Based on relationships presented in the cladogram and present distributions it is likely that the *Stigmina* originated in the southern hemisphere continents, especially Antarctica (Fig. 52) over 200 million years B.P. Australia was colonized once (*Paracrabro*). South America was colonized at a very early stage (180 million B.P.) on at least 3 separate occasions, and more recently by *Stigmus* from the Nearctic Region about 5 million B.P. North America was colonized at least twice, 3 times if one includes the incursion of Neotropical fau-

na (*Incastigmus*) into Central America about 5 million B.P. The Palaearctic was colonized at least twice; finally the Oriental Region was colonized on at least 2 occasions.

The great diversity of the Neotropical fauna is due to 3 major factors. The wet adapted fauna that colonized it, periodic aridity that likely restricted that fauna to islands of forest, and mountains that allowed extremes in climatic conditions to exist in close proximity. The xeric areas of southern Argentina afford the best opportunity to collect relict stigmene species in the New World.

By contrast the relatively depauperate nature of the Afrotropical fauna may be the result of a xerically adapted original fauna succumbing to the spread of mesic conditions over the entire continent, including the Sahara (Axelrod and Raven 1978). There was no, or very little, of the faunal island effect that occurred in South America. An increasingly wet Africa probably afforded little opportunity for the xerically adapted fauna to survive. Africa is again in a dry phase with rainforest restricted to very limited areas. The more equitable continental outliers such as the mesic islands of the Comoros or Madagascar probably still harbour remnants of relict faunas.

The interactions in the Oriental Region are complex. Most of the relict taxa are found there. Species of relict groups have highly localized distributions thus accounting for their relative absence in most collections. There is a possibility that their distributions are tied to forest over limestone terrain. Whitmore (1984) reported that limestone terrain is not common in Malaysia, but the flora of a mainland forest over limestone formation had 23% of its species endemic to the country with 11% endemic to limestone. Islands like Borneo or Sulawesi are melange formations (Hamilton 1979) resulting from nearby subduction zones indicating that limestone has likely been present throughout

the islands history. Although no habitat information is available for the relict fauna, it is likely, because of the high degree of endemic flora that limestone forest may offer fertile grounds for collecting specimens of these ancient apoid wasp lineages.

Little mention has been made of the origins of *Carinostigmus*. Two scenarios exist based on the cladogram, present distribution, and the number of undescribed species. In the first scenario I hypothesize an African origin with the genus in place at the time of rifting from South America or shortly thereafter. In the second scenario I hypothesize an Oriental origin with more recent colonization of Africa. The Oriental Region is a mix of land masses of Laurasian and Gondwanaland origin, and most species of *Carinostigmus* occur there (mostly undescribed). If a cladistic analysis of species within *Carinostigmus* were to demonstrate a Laurasian origin then the age of lineages in the Stigmata could be moved back to a Pangean origin about 230 million B.P. It would also imply a north-south Pangean split of lineages within the Stigmata with *Carinostigmus* of northern (Laurasian) origin and all other genera of southern origin (Gondwanaland). Such a scenario is compatible with the cladogram presented here and with ecosystem reconstructions of that period.

ACKNOWLEDGEMENTS

I wish to thank the reviewers of the manuscript, R.M. Bohart, A.S. Menke, and W.J. Pulawski, for their time and the numerous suggestions for improvements to the manuscript.

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Table 1. Data matrix for the Stigmata

	Carino	Tzustig	Arauca	Parac	Parastig	Aykhys	Stigmus	Llaqh	Incast
1. Palpal formula	0	0	0	0	0	0	0	0	0
2. Labrum shape	1	4	4	4	4	4	4	3	4
3. Mandibular socket	1	1	1	1	1	1	1	1	1
4. Apical manibular teeth	0♂ 2♀	0♂ 2♀	0♂ 2♀	0♂ 4♀	0♂ 0♀	0♂ 2♀	0♂ 0, 2♀	2♂ 2♀	2♂ 2♀
5. Apicoventral tooth	0	0	0	na	na	0	0	1	0
6. Clypeal bevel	0	0	0	0	0	0	1	0	0
7. Clypeus size	0	0	0	1	1	0	0	0	0
8. Clypeal teeth	2	3	4	5	4, 5	4	2, 4	4	4
9. Interantennal tubercle	1	1	0	1	0	0	0	0	0
10. Frontal carina	2	0	2	2	0, 2	0	0	0	0
11. Vertex micropore field	1	1	1	1	1	2	2	2	2
12. Eye margins	1	1	0	1	0	1	1	1	1
13. Occipital carina	0, 1	0, 1	0	1	0	0, 1	0, 1	0, 1	0, 1
14. Occi-hypo. carina	2	2	2	2	2	2	1, 2	2	2
15. Pronotal collar	1	0	0	0	0	0	0	0	0
16. Transverse pronotal carina	0	0	0	0	0	0	0	0	0
17. Median scutal groove	0, 1	0	0	0	0	0, 1	0	0	1
18. Notaular grooves	0	0	0	0	0	0	0	0	1
19. Acetabular carina	0	0	0	1	0	1	1	1	1
20. Omaulus	0	0	0	0	0	0	0	0	0
21. Episternal sulcus	1	1	1	1	1	1	1	1	1
22. Hypersternaulus	0	0	0	0	0	0	0	0	0
23. Orientation of hypersternaulus	0	0	0	0	0	0	0	0	0
24. Scrobal sulcus	0, 1	0, 1	1	0	0, 1	0	0	0	0
25. ♂ midbasitarsus	0	0	0	2	1	1	2	0	0
26. Hindtibial spines	2	1	1	1	1	1	1	1	1
27. Propodeal enclosure	0	0	0	0	0	0	0	0	0
28. Stigma size	1	1	1	1	1	1	1	1	1
29. Stigma shape	0	0	0	0	0	0	0	0	0
30. Stigma pore field	1	1	1	1	1	1	1	1	1
31. Marginal cell size	0	0	0	0	0	0	0	0	0
32. Marginal cell veins	0	0	0	0	0	0	0	0	0
33. Submarginal cells	0	0	0	0	0	0	0	0	0
34. Submarginal position	0	0	0	0	0	0	0	0	0
35. Submarginal veins	0	0	0	0	0	0	0	0	0
36. Discoidal cell number	1	1	1	1	1	1	1	1	1
37. Media divergence	2	1	0	0	0	0, 1	0	0	0
38. Submedian cell	1	0	0	0	0	0	0	0	0
39. Hind wing cells	0	0	0	0	0	0	0	0	0
40. Petiole length	2	2	2	2	2	2	2	2	2
41. Petiolar sculpture	2	0, 2	0	0	0	0	0	0	0
42. Sternum I carinae	0	0	0	0	0	0	0	0	0
43. S1 basal groove	0	0	0	0	0	0	0	0	0
44. T1 lateral carina	1	1	1	1	1	1	1	1	1
45. S2 microsetae	1	1	1	1	1	1	1	1	1
46. Pygidial Plate	1	1	1	0	1	1	1	1	1
47. Male Sternum 8	3	3	3	3	3	3	3	3	3
48. Genitalia	0	2	0	2	2	2	2	2	2
49. Microsculpture	1	0, 1	1	0	0	0	0	0	0

0 = plesiotypic character state, 1-6 = apotypic character states, na = not applicable, Carino = *Carinostigmus*, Tzustig = *Tzustigmus*, Arauca = *Araucastigmus*, Parac = *Paracrabro*, Parastig = *Parastigmus*, Aykhys = *Aykhustigmus*, Llaqh = *Llaqhastigmus*, Incast = *Incastigmus*.

Table 2. Data matrix for the Pemphredonina

	<i>Diodontus</i>	<i>Pemphredon</i>	<i>Passaloecus</i>	<i>Polemistus</i>
1. Palpal formula	0	0	0	0
2. Labrum shape	3	1	2	1
3. Mandibular socket	1	1	1	1
4. Apical manibular teeth	0, 1	2, 3, 4, 5	0, 2	0, 1
5. Apicoventral tooth	na	0, 1	0	na
6. Clypeal bevel	0	0	0	0
7. Clypeus size	0	0	0	0
8. Clypeal teeth	3	1, 2, 3	1, 2, 3	1
9. Interantennal tubercle	0	0	0	1
10. Frontal carina	2	2	0	2
11. Vertex micropore field	0	0	0	0
12. Eye margins	0	0	0	1
13. Occipital carina	0	0	0	1
14. Occi.-hypo. carina	1	1	2	2
15. Pronotal collar	0	0	0	0
16. Transverse pronotal carina	0	0	0	0
17. Median scutal groove	0	0	0	0
18. Notaular grooves	0	0	0	1
19. Acetabular carina	0	0	0	0
20. Omaulus	0	0	1	0
21. Episternal sulcus	0	0	0	0
22. Hypersternaulus	0	0	0	0
23. Orientation of hypersternaulus	0	0	1	1
24. Scrobal sulcus	0	0	0	0
25. ♂ midbasitarsus	1	1	1	1
26. Hindtibial spines	0	0	2	2
27. Propodeal enclosure	0	0	1	0
28. Stigma size	0	0	0	0
29. Stigma shape	0	0	0	0
30. Stigma pore field	0	0	0	0
31. Marginal cell size	0	0	0	0
32. Marginal cell veins	0	0	0	0
33. Submarginal cells	0	0	0	0
34. Submarginal position	0	0	0	0
35. Submarginal veins	0	0	0	0
36. Discoidal cell number	0	0	0	0
37. Media divergence	0	0	0	0
38. Submedian cell	0	0	0	0
39. Hind wing cells	0	0	0	0
40. Petiole length	1	2	1	2
41. Petiolar sculpture	0	1	0	0
42. Sternum I carinae	1	1	1	1
43. S1 basal groove	0	0	0	0
44. T1 lateral carina	0	0, 1	0	0
45. S2 microsetae	0	0	0	0
46. Pygidial Plate	0	1	2	2
47. Male Sternum 8	1	1	3	3
48. Genitalia	0	0	0	0
49. Microsculpture	0	0, 1	0	0

0 = plesiotypic character state, 1-6 = apotypic character states, na = not applicable.

Table 3. Data matrix for the Spilomenina

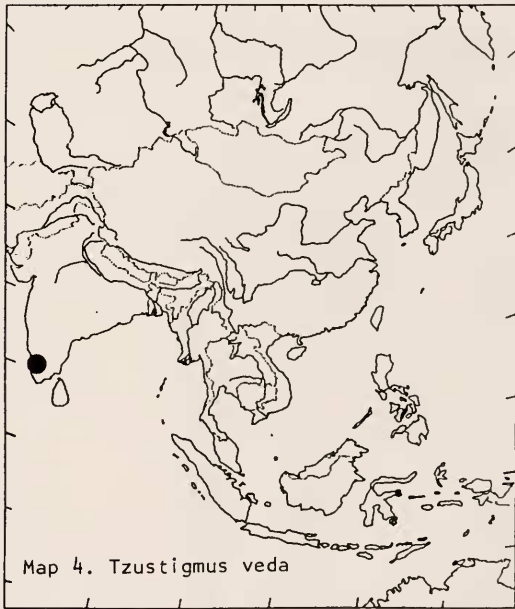
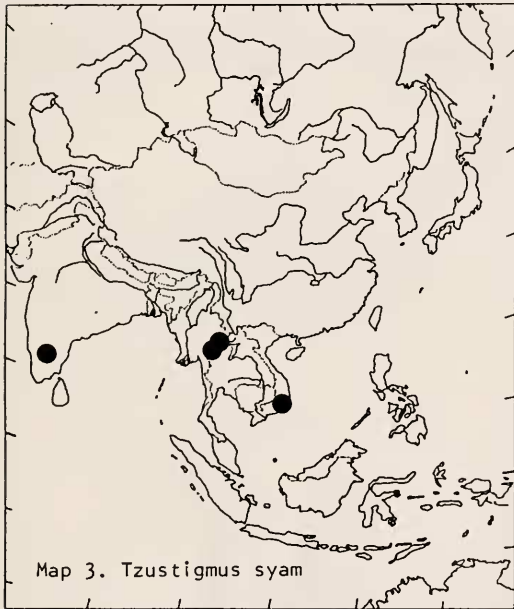
	<i>Arpactophilus</i>	<i>Spilomena</i>	<i>Microstigmus</i>	<i>Xysma</i>
1. Palpal formula	2	2	2	2
2. Labrum shape	3, 4, 5	4	0?	0?
3. Mandibular socket	1	1	1	1
4. Apical mandibular teeth	0	0	0	0
5. Apicoventral tooth	na	na	na	na
6. Clypeal bevel	0	0	0	0
7. Clypeus size	1	1	1	1
8. Clypeal teeth	2	2	2	1
9. Interantennal tubercle	0	0	0	0
10. Frontal carina	2, 3	0, 1	2	2
11. Vertex micropore field	0	0	0	0
12. Eye margins	1	0	0	0
13. Occipital carina	2	2, 3	3	3
14. Occi.-hypo. carina	2	na	na	na
15. Pronotal collar	0	0	0	0
16. Transverse pronotal carina	0	0	0	0
17. Median scutal groove	0	0	0	0
18. Notaular grooves	0	0	0	0
19. Acetabular carina	0	0	0	0
20. Omaulus	0	0	0	0
21. Episternal sulcus	1	1	1	1
22. Hypersternaulus	0	0, 1	0	1
23. Orientation of hypersternaulus	1	1	1	na
24. Scrobal sulcus	0, 1	1	1	1
25. ♂ midbasitarsus		1		
26. Hindtibial spines	2	2	2	2
27. Propodeal enclosure	1	0	1	1
28. Stigma size	1	1	1	1
29. Stigma shape	0	0	0	0
30. Stigma pore field	0	0	0	0
31. Marginal cell size	0	0	0	0
32. Marginal cell veins	0	0	0	1
33. Submarginal cells	0, 1	0	1	2
34. Submarginal position	0	0	0	0
35. Submarginal veins	0	0	0	1
36. Discoidal cell number	1	1	1	2
37. Media divergence	0	0	0	na
38. Submedian cell	0	0	0	na
39. Hind wing cells	0	0	0	1
40. Petiole length	0	0	0	0
41. Petiolar sculpture	na	na	na	na
42. Sternum I carinae	2	2	2	2
43. S1 basal groove	0	0	0	0
44. T1 lateral carina	0	0	0	0
45. S2 microsetae	0	0	0	0
46. Pygidial Plate	2	2	2	2
47. Male Sternum 8		2		
48. Genitalia		1		
49. Microsculpture	0	0	0	0

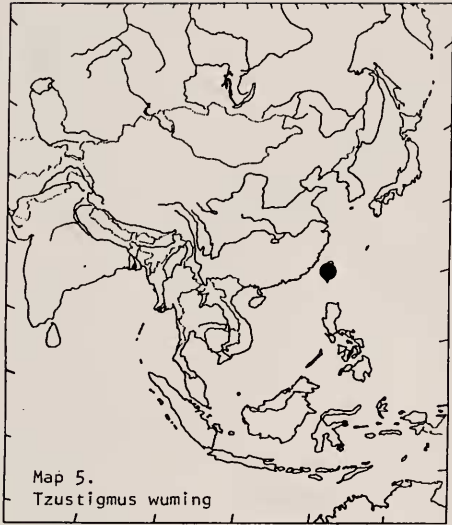
0 = plesiotypic character state, 1-6 = apotypic character states, na = not applicable, blank cells indicate specimens were unavailable and character state could not be determined from literature.

Table 4. Data matrix for the Ammoplanina

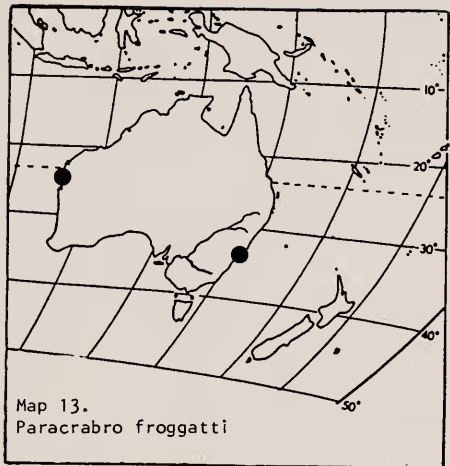
	Pulv	Ammops	Ammous	Paramo	Ammoplus	Timber
1. Palpal formula	1	1	1	1	1	1
2. Labrum shape	0?	0?	3	3	3	3
3. Mandibular socket	1	1	1	1	1	1
4. Apical manibular teeth	0	0	0	0	0	0
5. Apicoventral tooth	na	na	na	na	na	na
6. Clypeal bevel	0	0	0	0	0	0
7. Clypeus size	0	0	1	1	1	1
8. Clypeal teeth	2	2	2	2	2	2
9. Interantennal tubercle	0	0	0	0	0	0
10. Frontal carina	0, 1	1	0	1	0	1
11. Vertex micropore field	0	0	0	0	0	0
12. Eye margins	0	0	0	0	0	0
13. Occipital carina	2	2	2	2	0	3
14. Occi.-hypo. carina	2	1	1	1	1	na
15. Pronotal collar	0	0	0	0	0	0
16. Transverse pronotal carina	0	0, 1	1	1	1	1
17. Median scutal groove	0	0	0	0	0	0
18. Notaular grooves	0	0	0	0	0	0
19. Acetabular carina	0	0	0	0	0	0
20. Omaulus	1	1	1	1	1	1
21. Episternal sulcus	0	0	0	0	0	0
22. Hypersternaulus	1	1	1	1	1	1
23. Orientation of hypersternaulus	na	na	na	na	na	na
24. Scrobal sulcus	1	1	1	1	1	1
25. ♂ midbasitarsus	1	1	1	0	0	
26. Hindtibial spines	1	2	2	2	2	2
27. Propodeal enclosure	1	1	1	1	1	1
28. Stigma size	1	1	1	1	1	1
29. Stigma shape	0	0	1	1	1	1
30. Stigma pore field	0	0	0	0	0	0
31. Marginal cell size	1	1	1	1	1	1
32. Marginal cell veins	0	0	0	1	1	1
33. Submarginal cells	1	1	1	1	1	0, 1, 2
34. Submarginal position	0	1	0	0	0	0
35. Submarginal veins	0	0	0	0	0	0, 1
36. Discoidal cell number	1	1	1	1	1	1
37. Media divergence	0	0	2	2	2	na
38. Submedian cell	0	0	0	0	0	na
39. Hind wing cells	0	0	0	0	0	1
40. Petiole length	0	0	0	0	0	0
41. Petiolar sculpture	na	na	na	na	na	na
42. Sternum I carinae	0	0	0	0	0	0
43. S1 basal groove	1	1	1	1	1	1
44. T1 lateral carina	1	1	1	1	1	1
45. S2 microsetae	0	0	0	0	0	0
46. Pygidial Plate	0	0	0	0	2	2
47. Male Sternum 8	4	4	2	2	2	2
48. Genitalia	0	0	1	1	1	
49. Microsculpture	0	0	0	0	0	1

0 = plesiotypic character state, 1-6 = apotypic character states, na = not applicable, blank cells indicate specimens were unavailable and character state could not be determined from literature. Pulv = *Pulverro*, Ammops = *Ammoplanops*, Ammous = *Ammoplanus*, Paramo = *Parammoplanus*, Ammoplus = *Ammoplanellus*, Timber = *Timberlakena*.

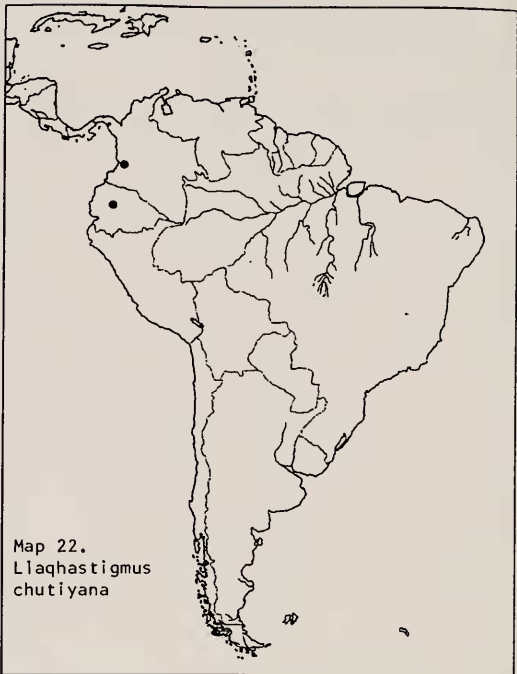


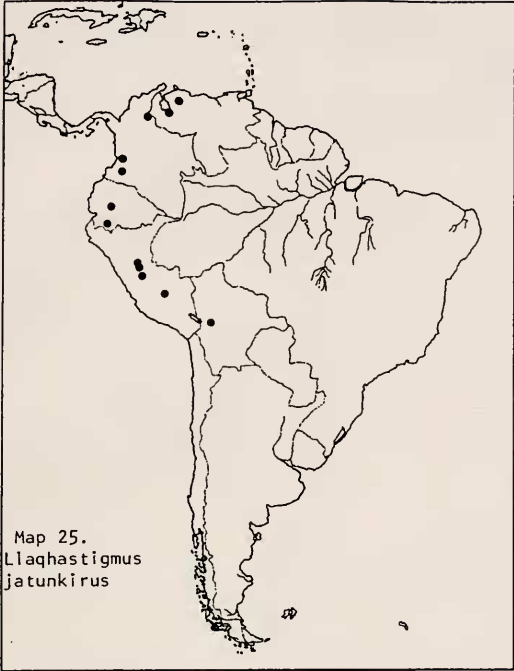












Map 25.
Llaqhastigmus
jatunkirus



Map 26.
Llaqhastigmus
llutani



Map 27.
Llaqhastigmus
mantanti



Map 28.
Llaqhastigmus
muthus

